The Birds
of British Columbia
9) Diving Birds and Tube-nosed Swimmers

by C.J. Guiguet

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HANDBOOK No. 29

The Birds of British Columbia

(9) *Diving Birds and Tube-nosed Swimmers*

By C. J. GUIGUET

Illustrations by Frank L. Beebe

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PRINCE GEORGE
KAMLOOPS
Kootenay District
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INTRODUCTION

This handbook deals with four orders of birds commonly called "divers" and an order of seabirds known as the tube-nosed swimmers. These groups of birds, though not closely related, have, in common, evolved to a largely aquatic environment. Most of the divers are very proficient in underwater activity; some of the tube-nosed swimmers less so.

The "diving ducks" (waterfowl) are treated in Handbook No. 15, and thus do not appear in this text. Herein, 36 species are treated—four loons, five grebes, thirteen tube-nosed swimmers, three cormorants, two pelicans, and nine Alcids (auks, murres, and puffins). These species represent all, within these orders of birds, that are so far known to occur in British Columbia and its adjacent littoral and pelagic waters.

Wherever possible, the use of Latin names and other scientific terminology are avoided. Common names and the distribution ranges used in the text follow the American Ornithologist Union Check-list of North American Birds, Fifth Edition (1957).

Metric measurements are approximate to the nearest decimal and only maximums are given where a range of measurements occurs.

ACKNOWLEDGMENTS

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—*C.J.G.*

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Diving Birds and Tube-nosed Swimmers

LOONS

Loons are large, streamlined, flat-bodied diving birds with large uncrested heads and thick necks. The bill is sharply pointed and without a hook. Legs are set at the stern end of the body; three toes webbed. Loons usually frequent open bodies of water and come ashore only to nest.

Common loon.

Description

The common loon (sometimes called "great northern loon" and "great northern diver") measures 28 to 36 inches (91.4 cm.) in length when adult. The sexes are coloured alike.

In summer plumage, the head and neck are velvety black with a greenish sheen; throat and sides of the neck are marked with a series of white streaks; the back is black, heavily marked with distinctive white spots; underparts are white. The upper parts of adults in winter and in young birds of the year are simply dark grey, underparts are white.

The bill in winter and summer adults is straight, black, and tapers evenly to a sharp point. Young in the first year have pale-coloured bills and distinctive square ends to feathers of the scapulars. In adult summer plumage the common loon is not easily mistaken for any other species. Immature birds with pale-coloured bills can be mistaken for the yellow-billed loon, which is a bird of equal size and appearance. The arctic and red-throated loons are smaller birds and should not be confused with this or the following species.

Range and Variation

Breeds in the northern part of the northern hemisphere from northern California north throughout much of the northern United States and Canada, and in northern Europe. In North America it winters chiefly from southern Alaska to California in the west; the Great Lakes, Newfoundland, south to the Gulf Coast and Florida in the east. In the old world from the North and Baltic seas, the English Channel south to the western Mediterranean, Madeira, the Azores, casually to the Black Sea.

In British Columbia during the summer it occurs throughout the Province where bodies of fresh water provide suitable nesting habitat. In winter, most frequent the sea along the entire west coast of the Province, but a percentage migrates southward.

The common loon is monotypic, occurring in one form throughout its range.

Voice

Perhaps no other bird sounds have been written of more than those of this loon. They have been referred to as lonely, haunting, demoniacal, maniacal, weird, and so on. Certainly, the often-

heard, long, single note and laughing call, ringing across a remote wilderness lake, is a very impressive sound. It is one long remembered by the outdoor traveller.

According to quotes in Bent (1919), four distinct calls are recognized—"First a cooing note, heard when there are several loons together; second, a long drawn out note, known among guides as the night call; third, the laughing call, which is familiar to everybody who has been in loon country; and fourth, a call which is not often heard, known among guides as the storm call."

Like most other birds, loons make a wide variety of notes other than the familiar well-known calls.

Nesting

The courting behaviour of a pair of common loons must be seen to be believed. The birds, standing erect, race side by side over the water, much in the manner of the western grebes shown in Disney's film, "Water Birds," no doubt familiar to many readers. These loons, however, are so much larger that the whole performance takes on a ponderous, slow-motion quality which is most dramatic. The pair sometimes face one another and carry out a spectacular ritualistic dance upon rapidly moving feet, with bodies entirely out of the water, and upright as in the side by side race.

The only performance I have ever witnessed was accompanied by a great deal of calling on the part of both birds.

Two large greenish, brownish, or olive-coloured eggs are laid, usually in May. These are marked by dark and light brownish spots. The incubation period lasts about 29 days. The eggs are laid in bulky nests made of reeds, sometimes on muskrat houses, but always on the water or water's edge, because this loon is practically helpless on land. When leaving the nest it simply slides into the water and clambers aboard upon return.

Incubation is continuous and both parents are believed to incubate.

Newly hatched young are covered in thick natal down, almost black throughout except for a grey and white belly patch. They gradually attain first-year plumage and by September have completed their first moult. They attain sexual maturity and full plumage when 2 years old.

Young leave the nest a day or two after hatching, and even at this stage are adept at swimming and diving. They are fed by the parents, first by regurgitation, later by bill-offered food, until capable of catching their own.

Food

Food is secured by direct underwater pursuit and capture by grasping with the bill. The common loon is very adept below the surface and travels at remarkable speeds. Apparently, little use is made of the wings in underwater locomotion. Propulsion is accomplished mainly by powerful thrusts of the webbed feet. Wings may be brought into play when greater acceleration is required. At any rate, the common loon catches such fast-moving fishes as trout with apparent ease. Sculpins, flounders, herring, and the like must present little problem. There are a few records of loons eating aquatic plants and amphibians. Aquatic insects and reptiles make up a small part of the diet.

Migration

It seems that most common loons nesting in British Columbia migrate from the fresh-water environment to the sea in the fall, after the young have become capable of flight. Later, a southward migration occurs, but a percentage of birds remains in northern waters and may be seen foraging up and down our coastlines during the winter months.

YELLOW-BILLED LOON

(Not illustrated)

Description

Like the common loon but with a pale-yellow bill. In adults the bill has an upward angle on the lower edge, which gives the whole bill a tilted-up appearance. In the common loon the bill is straight. In summer there is more of a purple sheen to the plumage of the head; striping on the throat and the sides of the neck are fewer and coarser; white spots on the back are larger and fewer than in the common loon. In winter adults, bill shape, colour, and

pale shafts to the primary feathers separate the yellow-billed from the common loon.

Range and Variation

In North America the yellow-billed loon occupies a nesting range confined to the arctic and subarctic regions. The range extends from Alaska and northern Yukon, east to the Melville Peninsula, north through some of the Arctic islands, and south in the barren grounds of northern and central eastern Mackenzie (Hanbury River, Thelon River, but not in the Mackenzie Valley), and south central Keewatin (Godfrey, 1966).

It winters chiefly in the northern Pacific around Alaska, occasionally wandering south as far as the Queen Charlotte Islands and southern Vancouver Island in British Columbia. The yellow-billed loon occurs also in northern Siberia and in northern Norway and Finland.

Nesting habits, voice, food, and behaviour are apparently similar to those of the common loon.

Some believe the common and yellow-billed loons are subspecies of one species. Most authors, however, give each full specific status, in that little or no evidence of intergradation has been brought forward.

ARCTIC LOON

Description

The Arctic loon measures 23 to 29 inches (73.7 cm.). In adult summer plumage the crown and hindneck are a soft, buffy-grey colour. Otherwise this bird somewhat resembles the common loon. The bill is black and evenly tapered. There are long, fine, white stripes down each side of the neck, and coarse white markings on the black plumage of the back. Underparts are white, summer and winter.

In winter adults the back is black with no white markings or white edgings to the feathers, which readily separates the species at this time from red-throated and common loons. Young of the year resemble the winter adult, but the plumage is more brown and feathers of the back are edged in grey.

Iridescent sheen on the throat varies with subspecies.

Arctic loon.

Range and Variation

In summer breeding, Arctic loons occur in the old world in northern Europe and in northern Russia; in the new world from Alaska east to the Melville Peninsula and southern Baffin Land. They breed south to the Alaskan Peninsula in the west and northern Ontario in the east.

In Europe and Asia the Arctic loon winters south to Portugal, the Mediterranean, Black and Caspian Seas, and to India and Japan. In North America it winters from Alaska south to Baja California and the coast of central Sonora.

Three subspecies are recognized, a new world form which is distinguished mainly by a purple sheen to the plumage of the throat. The Asiatic subspecies has a greenish sheen and occurs sometimes in western North America. A European subspecies

seems to be confined to Europe with no overlap into North America. I can find little in the literature regarding its present status.

So far there are no valid nesting records for the Arctic loon in British Columbia. It nests to the north of this Province in Alaska, the Yukon, and Northwest Territories. It is seen on the sea in large numbers during spring and fall migration and constantly in smaller numbers flighting up and down the coast in winter.

Voice

A flight call is the only noise I've heard the Arctic loon make, but then I have seen it only in winter and during migration, not on the breeding grounds. Most birds are more vocal during the breeding season.

Various authors (Godfrey, 1965; Bent, 1919) have described the voice as varied with frequent raven-like croaks and growls, prolonged mournful wails, and other noises difficult to describe. Apparently this bird, like the other loons, is very noisy on its breeding slough or lake. The flight call is described as a "guttural kwuk-kwuk-kwuk."

Nesting

Like other loons, this species builds a bulky nest of aquatic vegetation at the water's edge or in the reedy shallows. Two, rarely three, eggs are laid in June or July. They are smaller than the common loon's eggs but similar in colour. They vary from brownish to greenish undertones with an overlay of fine and coarse dark and lavender-coloured markings.

Period of incubation is probably somewhat less than that of the larger common loon, about 29 days. Both parents are said to incubate the eggs and to care for the young.

Downy young, brown in colour at hatching, gradually assume the first juvenal plumage previously described. They reach maturity in two years.

Food

This bird has been closely observed swimming underwater in pursuit and capture of fish (Bent, 1919). It was noted that both

wings and feet were used. This accounts for the long distances that this and other loons can traverse underwater in such short periods of time. Fish are caught with apparent ease.

Migration

These birds sometimes migrate in large, compact flocks, but are usually seen in small, widely spaced flocks moving at 40 to 100 feet above the surface of the sea. Main migratory movement northward along the British Columbia coast is in May and June, when numbers are commonly seen feeding and passing by in such places as Active Pass and Barkley Sound (Guiguet, 1970). Southward migration occurs mainly in October, with some birds remaining to winter at various points all along the coast.

RED-THROATED LOON

Description

This bird is about the same size as the Arctic loon and noticeably smaller than the common and yellow-billed species. It measures 24 to 27 inches (68.5 cm.) in length. Like other loons it is white below in all plumages. In adult summer plumage it is grey rather than black above, and the back is speckled with fine, pale markings that can be seen only at very close range. The bold, white back markings of the other loons are lacking in this species. The head is grey with a maroon-coloured throat patch and the hind neck is striped in fine, white lines. The bill is dark with the lower margin sharply angled, resulting in a pronounced tilted-up appearance. In winter this species appears simply grey above and white below, with no scaling as in the common loon, that is, with no light edging to the feathers on the back. The Arctic loon in black on the upper parts in winter.

Range and Variation

This species occurs in one form throughout its range and is circumpolar in distribution. The bulk of nesting is northern, but we have records in British Columbia south to mid-Vancouver Island. I believe this species nests on many small lakes along the British

Red-throated loon.

Columbia coast. There are records from the Queen Charlottes and I have personally collected breeding records at Spider Island and observed other birds in breeding plumage foraging at those latitudes (52°N.) throughout the summer (Guiguet, 1953). In North America the red-throated loon winters south to Mexico in the west and to the Gulf of Mexico in the east. It occurs rarely in the Interior, mainly in migration. In British Columbia it is a common winter resident all along the coast.

Voice

The flight call is like that of the Arctic loon, a repeated "kwak-kwak-kwak," as it is expressed phonetically by so many observers. On the breeding lake, when disturbed, the variety of noises produced by these birds is impossible to describe. It is unbelievably

loud and perhaps can be best expressed as "caterwauling." When undisturbed, a variety of more-subdued calls may be heard.

Nesting

Like that of previously described loons. This bird, however, can utilize smaller lakes as it does not require such a long, straight run for take off as do the other loons. Most often the Arctic loon will dive rather than fly when disturbed on the water, but the red-throat will usually take wing. Nest and eggs are similar to those of the other loons described previously in this book. Period of incubation is probably similar to that of the Arctic loon, somewhat less than the common loon's 29-day period. Both parents incubate and tend the young. Young are capable of flight by late September when adults have completed their moult.

Food

In coastal British Columbia these birds feed largely upon sand-lance and herring, the "bread and butter" fishes of this region. They are said to eat also "frogs, spawn, crustaceans, and molluscs."

Migration

Many birds winter along the northern Pacific coastline, including that of British Columbia. There are definite large spring and fall movements, however, with large, concentrated flocks observed on the sea. Like the Arctic loon this species migrates in widely spaced flocks.

GREBES

Grebes are highly specialized diving birds, characterized mainly by flattened feet and lobed toes which trail out behind when the birds are in flight (Fig. 1). The tail feathers are practically non-existent.

FIG. 1. Flattened and lobed feet and nails.

Grebes have the ability to slowly submerge by sinking, or to do so quickly by diving. Unlike some diving birds, grebes do not use the wings underwater but propel themselves solely by frog-like kicking of the feet and legs.

The legs are placed far back on the body, consequently, like loons, grebes are very awkward on land.

WESTERN GREBE

Western grebe.

Description

The western grebe is the largest of five species of grebes occurring in British Columbia. From the tip of the bill to the end of the tail it measures about 28 inches (71 cm.). The body is flattened, the bill long and pointed, the neck long and serpentine. The legs

and feet are flattened, with the lobed toes and flat nails common to this family of birds.

In both sexes the top of the head and back of the neck are black; the back and wings are grey, and the underparts are silvery white. This simple pattern is distinctive and enables one to recognize the western grebe at rest even when seen at considerable distance. When in flight the neck is fully extended and the rather large legs and feet trail behind. The wing beat is rapid, and, though strong, one gets the impression of weak flight, probably because the wings are relatively small. At any rate, these characteristics are very good recognition features in identifying the birds in the air. Like other grebes, the western is strictly a water bird. It frequents both fresh-water lakes and the sea, the latter being the main wintering habitat, the former utilized largely for nesting purposes.

When diving, the grebe gives a peculiar flip and disappears cleanly below the surface. It is capable, too, of gradually sinking, until it appears that only the head and neck are above the surface.

Range and Variation

The western grebe ranges from southern Manitoba, west to the Pacific Coast, south to southern California, and north through Alberta to Alaska. It is thus well named, being confined to the western part of the continent. In British Columbia it is known to nest at Williams (Munro, 1941), Swan, and Shuswap Lakes (Stirling, 1962), but most of the population migrates over the mountains to breed in Alberta and Saskatchewan. In winter, spring, and fall it is very common along the southern coastlines and in most of the inlets. It sometimes remains on large, fresh-water lakes during mild winters when such bodies of water remain open.

The western grebe shows no variation throughout its range.

Nesting

The aquatic courtship ritual of the western grebe is a spectacular performance. It has been filmed, and no doubt some readers have seen it in Disney's film entitled "Water Birds." It consists chiefly of a running "duet" on the surface of the water. The male and female in upright penguin-like stance, with neck arched and

bill pointed down, run rapidly over the water, side by side. This is preceded and followed by various neck-archings and posturings, all part of the courtship ritual.

The eggs are deposited on a mass of floating debris gathered for the purpose, and anchored in cover such as stands of bulrush and other aquatic plants provide. From 5 to 10 bluish-white to cream-coloured eggs are laid in May and June. These hatch after an incubation period of about 23 days. At hatching, the young are clothed in thick-grey natal down, darker above than below. The downies are precocial and leave the nest a short time after hatching. In a few weeks they have assumed first juvenal plumage, which resembles that of the adult birds, though the black on the head and neck is not so clearly defined.

Voice

The call of the western grebe is described as a "double-toned whistled c-rr-ee-er-rr-ee" and "a voice, high and broken like nothing else perhaps so much as the creak of a neglected pulley" (Bent, 1919). Although I have heard the call of this bird often I am at a loss to express it in writing, and certainly the above descriptions convey nothing to me. Once you've heard and recognized it, however, you will experience no difficulty in attributing the sound to the bird.

Food

The western grebe subsists largely upon small fishes which are taken in underwater pursuit. Grebes do not use the wings in underwater swimming. The legs and feet are activated in a frog-like manner which propels the bird at a good rate of speed fast enough to secure fishes.

Aquatic insects and their larvæ, amphibians, and even aquatic plants are eaten as well as fish.

Migration

Spring migration occurs in March and April along the coast. The birds then appear to fly inland, appearing on the Interior lakes in April and May. In the fall, wintering populations appear on the sea in September and October.

Horned grebe.

HORNED GREBE

Description

The horned grebe is a comparatively small bird, measuring some 14 inches (35.3 cm.) from the tip of the bill to the tip of the tail. In structure it is typically grebe-like, with a flat body, relatively long neck, sharp-pointed bill, flattened legs and feet, and with practically no tail. The legs are set well back on the body, and like other grebes this species is very awkward when on land.

There are two distinct plumages summer and winter, but birds in stages between are commonly seen in early spring and in the fall. In winter plumage the top of the head is black, the hind neck and back grey, the underparts and cheeks white. In summer plumage the head, which appears to be hooded, is black with a golden-yellow bar running through the eye and extending over the ear as a conspicuous tuft. The foreneck, upper breast, and flanks are

rich, rufous brown and the hind neck and back dark grey, almost black. Below, the bird is silvery white and a white patch shows on the wings in flight. The sexes are coloured alike and full-grown young of the year resemble adults in winter plumage.

Range and Variation

The horned grebe occurs in summer from central Alaska eastward to northern Manitoba, occasionally to Ontario, and as far as the Maritimes. It ranges south throughout British Columbia and the Prairie provinces to the central and western United States and sporadically eastward to New York State. In fall it migrates from the breeding areas to winter on the sea and occasionally on the Great Lakes. On the Pacific it ranges from the Aleutian Islands south to southern California; on the Atlantic, sometimes from Greenland, but mainly from Nova Scotia south to Florida.

Only one subspecies occurs in North America. Another, found in Northern Europe and Asia in summer, winters south to the Mediterranean in the west and to Japan in the east.

Nesting

The horned grebe, like other grebes, nests on the water. It builds a bulky, floating structure of rushes and other aquatic vegetation. This is usually anchored to rushes, but not necessarily when the cover in very thick. The eggs, similar to those of the other small grebes, are bluish or greenish-white, often dirtied and stained so as to appear brown. Usually four to six eggs are laid, but as many as 10 have been recorded. The nesting date varies with latitude and with individual birds, so that eggs may be found from April through May, June, and early July. This grebe covers its eggs with debris when it leaves the nest. The incubation period is probably about three weeks.

Downy young are precocial and, shortly after hatching, are active in swimming and diving. They are mostly dark grey, almost black in colour, but are distinctively marked with a white V on the forehead, a white stripe on the crown, and with broad white lines extending down the neck to the back. The throat and sides of the head and neck are pinkish-buff spotted with dusty markings.

By fall, these young have attained their full juvenal plumage and resemble the winter adult, but early in the fall indications of the striping and spotting may still be present. Like other grebes, the horned grebe is a strong flier when once under way, though a once-popular misconception held that grebes were incapable of flight.

Voice

"The love song of the horned grebe is a wonderful combination of weird, loud, striking notes, difficult to describe, but once heard it will never be forgotten; it consists of a series of croaking and chattering notes, followed by several prolonged piercing shreaks; it seems remarkable that such a volume of sound can come from so small a bird" (Bent, 1919).

Call notes have been variously described as nasal "keogh, keogh," a sharp "keark, keark," and as "yark, yark." As with the "song" however, these phonetics mean little until you've heard the bird.

Food

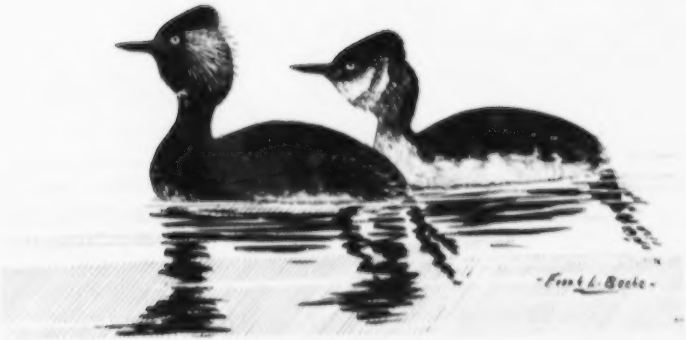
The horned grebe is an excellent diver and underwater swimmer. When on the sea it feeds largely upon small marine fishes such as sandlance, small herrings, sculpins, and the like. It is known also to feed upon a variety of marine crustacea.

When on fresh water it feeds on small fresh-water fishes, on amphibians, aquatic insects, and even upon aquatic plants.

Very often the stomachs of grebes contain a mass of feathers which have been ingested, but for what purpose is unknown.

Migration

This is a common wintering bird along the British Columbia coast. It migrates to nesting lakes throughout the Interior of the Province in April and May, returning to the sea mostly in September and October.



Eared grebe.

EARED GREBE

Description

This bird is known to many as the black-necked grebe. It is a small grebe measuring about 13 inches (33 cm.) in total length, and the sexes are coloured alike. It is similar in size, shape, and in winter plumage to the horned grebe, but has a distinctive summer plumage. The eared grebe has a black neck and head, the latter crested, whereas the horned grebe's neck is largely red and the head, though black, is hooded. The yellow facial plumes of the eared grebe are splayed out, fan-shaped from behind the eye, and are paler in colour than are those of the horned grebe, which are concentrated as a tuft. In both species the underparts are silvery white, the flanks red, and the back dark grey, almost black.

Juvenal plumage resembles that of the winter adult. It is dark grey on the back; black on the hind neck and head, and with underparts white. In this plumage it is difficult to separate the eared from the horned grebe. In typical examples the bill proportions are quite different and easily seen. The bill of the eared grebe is

wider than high, that of the horned grebe narrower than high. In some cases, however, these proportions are not apparent and are difficult to distinguish, even with birds in hand. With birds on the water at a distance it is practically impossible to assess the bill characteristics. However, the eared grebe is slightly smaller and has a noticeably slimmer neck, which is carried straighter than is that of the horned grebe. This can be seen at a distance and is a good criterion, especially when both species are being observed.

Range and Variation

The eared grebe occurs in North America "from central British Columbia and southern Manitoba to northern Baja California, New Mexico, and western Minnesota." It breeds south in this range to Baja California, southern Nevada, and Texas, and winters over most of the range where open water permits. In British Columbia it nests around sloughs and lakes of the central and southern Interior and, as these usually freeze over during the winter, the grebes migrate to the Pacific Coast or southward. A considerable number of eared grebes winter along our southern coastlines.

There is but one subspecies in North America, a similar form occurs in Europe and Asia.

Nesting

Like other grebes, this one is helpless on land and consequently nests on the water. It builds a floating nest from aquatic vegetation such as reeds, rushes, and mosses. The mass is usually anchored in shallow water. The eared grebe often nests in large colonies, with nest structures poorly built and some barely able to support the weight of the incubating bird. Sometimes the eggs become immersed in water, a condition which usually results in hatch failure.

The eggs number four or five, but from three to nine may be found. These are identical to the eggs of the other small grebes, being bluish-white but usually stained to a brownish colour. After an incubation period of about three weeks, the young hatch and almost immediately leave the nest. At this time they are capable of swimming and diving, but often clamber on the mother's back

when disturbed. Downy young are black on the back, with brown or grey striping on the forward parts. The underparts are white with a buffy to pinkish wash on the breast and throat. The head is grey, spotted or striped in white. This plumage is gradually replaced by juvenal plumage until the birds are fully grown late in the fall.

Voice

When courting, the black-necked grebe is vociferous and as it often occurs in large numbers in some breeding areas, quite a volume of sound is produced. Dawson, in Bent (1919), describes the individual song of the grebe as "Poo-eep, poo-eep—given deliberately with a gentle rising inflection which seems to vanish at the end with a wort of sabre-like flourish." He also describes a more strident call as "an excited hicko rick up, hicko rick up, hicko rick up." These are apt descriptions, but the actual sounds must be heard to be appreciated.

Food

Stomach analyses indicate that on the fresh-water habitat the black-necked grebe feeds mainly upon aquatic insects, including dragon-fly nymphs. Tadpoles, very small frogs, shrimps, and some vegetation have also been recorded.

On the sea they probably live on small marine crustaceans, although small sandlance, herring, sculpins, and the like are almost certainly taken.

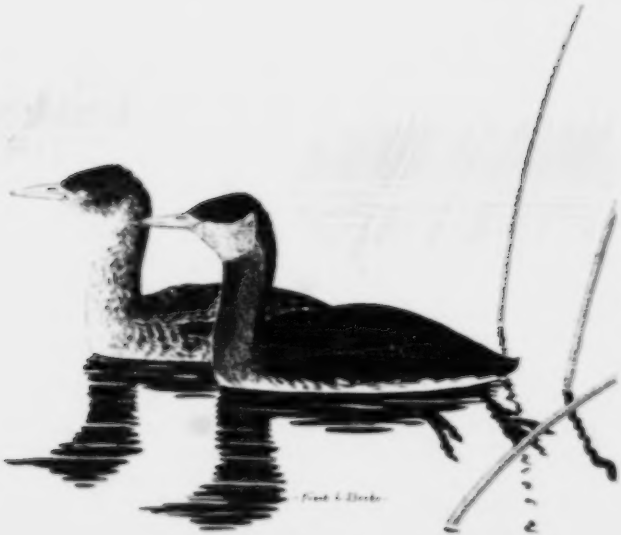
Migration

This, like the other grebes occurring in British Columbia, winters mainly on the sea. In spring most of the birds leave for the Interior nesting areas in April and May. They reappear on the sea mostly in September and October.

RED-NECKED GREBE

Description

The red-necked grebe, known also as Holboell's grebe, is not as large as the familiar western grebe but is much larger than the



Red-necked grebe.

other three species occurring in British Columbia. It averages about 19 inches (48.2 cm.) in total length. The neck is long, the body compressed and streamlined, and the tail so short that it can be seen only on close examination.

In summer plumage the adult has a white face and underthroat, a black crown, slightly tufted and with the black extending down to blend with the dark grey of the back. The front and sides of the neck are rusty red, terminating gradually on the upper breast, which is silvery white like the rest of the underparts. The back is unmarked, but the wings, also dark grey above, have a prominent white patch which is visible only when the bird is in flight.

Sexes are coloured alike, but winter and summer plumage are quite different. The winter plumage is grey above, light below, the

distinctive features of summer plumage reduced to a black crown and a white crescent-shaped mark on each side of the face. Young in their first year resemble winter adults, but are without the white facial markings.

Range and Variation

This grebe has a wide distribution in the Northern Hemisphere. In summer it breeds in northern and central areas of Europe, Asia, and North America. In North America it winters in the west to California, and in the east to Georgia and central Florida. In British Columbia it is a fairly common nesting bird in the central and southern Interior, less common on Vancouver Island and in the northern reaches of the Province. It is a common wintering bird along the British Columbia coast.

Two subspecies occur, one extending through western Europe to, and including, western Asia. The range of the second extends across North America to northeastern Siberia and Manchuria.

Nesting

Like all grebes, the red-necked grebe is almost completely helpless on land and thus lives and nests on the water. It builds a floating structure of rushes, reeds, and other aquatic vegetation, usually in areas of cover provided by such plants. From three to eight eggs are laid during May and June. These vary in colour from whitish-blue to buff, but the colours are usually obscured by mud and nest stains so that the eggs appear dirty brown. After an incubation period of 22 or 23 days, the young hatch and are almost immediately capable of swimming and diving.

The downy young are remarkable-looking birds, dark, almost black above, whitish below, but strikingly marked about the head, neck, and back. The head has a white V on the top and longitudinal white stripes which are present on the neck and back as well. These stripes often carry a pinkish or buffy tinge which sometimes persists until the birds have grown to considerable size. By late fall, however, the young have assumed juvenal plumage and are ready to migrate to the wintering areas.

Voice

This is a noisy grebe with a wide variety of calls and notes which are all difficult to describe. Bent (1919) quotes several authors as follows: "It (the call) is a prolonged nasal quonk, the nasal quality being most pronounced . . . " or "a harshly raucous cawack," and finally "a series of loon-like wailing cries, loud and piercing at first and then runs off into a series of short plaintive, vibrating wails, "ah-ooo, ah-ooo, ah-ooo, ah, ah, ah, ah, ah," sometimes it ends in a more stacato chattering trill and might be indicated thus: "whooa, whooa, whooa, whooa, whooa, chitter-r-r-r."

Once heard, the cries of these birds are easily recognized a second time.

Food

A wide variety of aquatic foods has been recorded as part of the diet of this grebe. It frequents both salt- and fresh-water habitats over a wide range and takes whatever the locality has to offer. On the British Columbia coast it feeds largely upon small sandlance, herring, sculpins, blennies, and small marine crustacea during the winter. In other areas it is known to eat crayfish, salamanders, frogs, aquatic insects, and several species of small fresh-water fishes.

On many occasions I have observed this species, as well as the horned grebe and pelagic cormorant, being robbed of their prey by glaucous-winged gulls. The gull simply waits on the water until the diving bird surfaces and then deftly snatches the prey from its bill. On one occasion I observed what appeared to be an apparent miscalculation on the part of the gull. It seized the grebe's head, bill, fish and all, and as if sensing an unforeseen windfall, proceeded to kill and eat its benefactor.

Migration

Many of these birds winter along the British Columbia coast. Migration from the south is mainly in March, April, and May. In fall the birds begin to appear on the sea in September.

Pied-billed grebe.

PIED-BILLED GREBE

Description

The pied-billed grebe is quite different in general appearance from the other four species of grebes occurring in the Province. It is small, measuring about 13 inches (33 cm.) from bill to tail, comparable in size to the eared and horned grebes but smaller than the red-necked and western grebes. In general colour the adult in summer is grey above, brownish-grey to white below, with indistinct barring on the flanks. In this respect it differs from adults of the other grebes which are completely silver-white below. The neck of the pied-billed grebe is heavier than those of the other small grebes, and the bill thick and blunt rather than sharp and stilleto-shaped. Sexes are coloured alike. In adult summer plumage there is a black vertical bar through the bill and a black patch on the throat, both of which disappear when winter plumage is

assumed. In flight, the other grebes show prominent white wing-patches, but this species has none and, consequently, because of this and the other distinctive features, is very easily identified.

Range and Variation

The pied-billed grebe ranges from central British Columbia eastward across the continent to New Brunswick and southward locally through Central America, the West Indies, and South America to Chubut, Argentina. This range is not continuous and in some areas the species is seldom seen.

In British Columbia it nests north at least as far as Ootsa Lake and is found summer and winter on Vancouver Island and the Lower Mainland. In winter the birds from the cold Interior parts of the Province migrate to the southern United States and to the southern coastal regions of the Province. On the coast in winter it frequents fresh-water ponds to a much greater extent than do the other grebes, many of which confine themselves to the sea at this time.

There are casual records north of the normal range of this bird from Alaska, the Yukon, Baffin Island, Labrador, Newfoundland, and, accidentally, on the Azores.

Over this entire range there is no apparent variation in the pied-billed grebe.

Nesting

Like other grebes, the pied-billed builds a floating structure of reeds and various aquatic plants upon which to lay its eggs. The nest is usually anchored to the stems of plants in a foot or two of water. The sites selected by this species are usually in heavy cover, whereas the other grebes very often nest where the cover is sparse. From three to ten bluish-white eggs are laid in May and June.

The incubating bird usually covers the eggs when it leaves the nest, and as the eggs soon become stained and dirty, one must look carefully to see them. After an incubation period of 23 or 24 days, the downy young hatch. These, like the young other grebes, leave the nest soon after hatching and are then adept at swimming and diving. They are glossy black on the back with longitudinal stripes of greyish-white running up on the neck. The crown is black with

a wash of reddish-brown. There are two broad white stripes over the eye which converge and join at the forehead; above these are two more white stripes. The sides of the body are dusky, the under parts greyish-white, lighter on the belly. This plumage is gradually replaced by juvenal plumage which resembles that of the winter adult, but is whiter on the underparts and reddish on the breast, neck, and flanks.

Voice

Most writers, when referring to the call of this grebe, say that it has a cuckoo-like quality. The calling is restricted pretty well to the breeding season and has been described in various ways. Dawson, in Bent (1919), expresses it as "an odd bubbling giggle, keggy, keggy, keggy—etc., rendered with great rapidity"; he also refers to "a single aow, uttered from time to time . . ." Chapman expresses the call of the courting male as "cow, cow, cow," repeated 10 or a dozen times and terminates with "cow-uh, cow-uh, cow-uh —cow-uh." To this, he says, the female replies with "cuk-cuk-cuk, followed by a slower ugh, ugh, ugh."

There are several other interpretations, which, like those for other birds, are often meaningless unless one has previously heard and identified the call with the bird.

Food

"The pied-billed grebe feeds largely on animal matter such as small fish, snails, small frogs, tadpoles, aquatic worms, leeches, and water insects; it also eats the seeds and soft parts of aquatic plants to some extent. Balls of its own feathers often occur in the stomach. Although this grebe is essentially a fresh-water bird more so than other species, Audubon, in Bent (1919), states that when its favourite ponds and streams are frozen over, it may occasionally be seen in bays and estuaries searching for shrimps and fry." This quotation applies particularly well to the pied-billed grebe in British Columbia.

Migration

Spring migration takes place in March and April, this being one of the first species of birds to appear on the breeding ponds. Fall migration is mainly in October, with birds gone from the Interior in November.

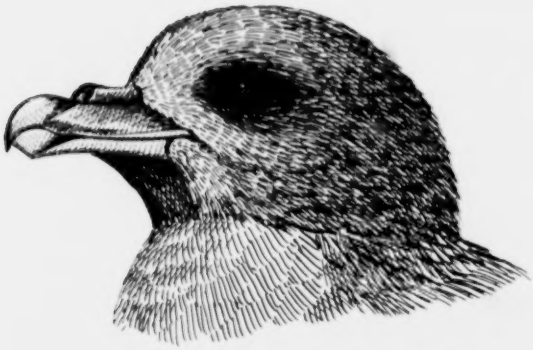


FIG. 2. Note tube-like nares and plated bill.

TUBE-NOSED SWIMMERS

This order of birds is made up of albatross, shearwaters, fulmars, and petrels. As the name implies, these birds have in common tube-like external nostrils which are directed forward (Fig. 2). Other characters in common are bill covering composed of horny plates, three toes webbed, hind toe reduced in size and free, ejectable stomach oil, strictly sea birds coming ashore only to nest.

They range in size from a few inches of wing spread in the small petrels to 11½ feet (3.5 m.) in the large wandering albatross of the southern seas.

In British Columbia's littoral and pelagic waters (i.e., the sea close to shore, and the open sea farther out), three species of albatross are known to occur. There are six species of shearwater, three of petrel, and one fulmar.

Only the fork-tailed and leach petrels are known to nest in British Columbia. The other species, apart from the fulmar, are southern nesters migrating northward after their breeding season (which occurs during our winter). Thus we encounter them mainly during our summer months, although nonbreeding birds may be seen at any time of the year. The fulmar is a northern nester and occurs in British Columbia waters mainly during the fall and winter.

SHORT-TAILED ALBATROSS

Description

The short-tailed albatross measures 37 inches long (94 cm.) and has a wing spread of 7½ feet (2.3 m.). In adult plumage the body is white, wings and tip of tail black. This pattern readily

Short-tailed albatross.

separates it from the adult Laysan albatross, also a large white bird with narrow dark wings, but which has a black back. Immature short-tails resemble the more often seen black-footed albatross, being uniformally dark in plumage. However, the feet and bill are pink or flesh-coloured rather than black or dark brown.

Albatross are winged sailors, gliding over the seas on long narrow wings that are flapped only at relatively long intervals. This characteristic and their large size makes identification very easy.

Range and Variation

There are records of this species from the Straits of Juan de Fuca from 1889 to 1893. Two mounted specimens secured at that time are in the Provincial Museum collections. It was said to have been of common occurrance in the straits and in pelagic waters of British Columbia until the turn of the century. None has been recorded since. Apparently, early feather-trade activities on the main breeding islands of Bonin and Wake brought the species to the verge of extinction. Sight records in the North Pacific during the past decade indicate that under protection the short-tailed albatross is making a comeback (Weathership Reports, 1970).

Voice

According to Bent (1922), birds of this species, though usually silent, do make a "braying noise on occasion." They are probably more vocal on the breeding grounds than when foraging over the ocean.

Nesting

Judging from most reports, the short-tailed albatross nests in November or December. A single, large, whitish egg, marked with brown or purplish blotches and spots, is tended by both parents. The nest is merely a slight depression in the sand.

Incubation period is probably like that of other large tubinares, about six weeks. Young grow rapidly and are fed by regurgitation. They are grown by June and July and ready then to forage over the oceans.

Food

Squids, fishes, carrion, and offal from whaling and fishing vessels are reported to be eaten by this species.

Migration

Dispersal over wide areas of the Pacific Ocean during non-breeding period.

LAYSAN ALBATROSS

Description

The Laysan albatross is like other albatross in structure, but is somewhat smaller in size. Adults measure 32 inches (81.3 cm.) from nose to tail and have a wing spread of 6½ feet (2 m.). Sexes are alike in colour. Adults in full plumage are white with black wings and back. The feet are a dull flesh colour. The black back readily separates adults of this species from the white-backed, short-tailed albatross and the all brown, black-footed albatross. Immature birds are similar to adults in plumage, thus easily distinguished from short-tailed and black-footed juveniles which are both brown.

Range and Variation

This species nests on that chain of islets that stretches to the northwest of the main Hawaiian Islands and includes such famous bird islands as Nihoa, Laysan, and Midway. Adults spend six or seven months of the year on or near the nesting island, roughly from late October or early November, until the following June or July. The remainder of the time is spent foraging over the central Pacific Ocean. Although no specimens have been collected in the pelagic waters off the British Columbia coast, the species is reported regularly well off shore during the summer months.

There is no geographical variation apparent in Laysan albatross populations.

Voice

According to reports, these birds are quite noisy on the breeding grounds during the courtship displays, largely silent when foraging. Sounds for this species are described under "Nesting."

Laysan albatross.

Nesting

A single, large, ovate egg, smaller at one end, is laid in mid-November. As with other species, the nest is a depression in the sand but differs in having an elevated rim of sand around it. This is accomplished by the incubating bird reaching out with the bill and pulling sand up against its body. Conjecture is that this aids in keeping the nest dry when it rains. Other albatross, however, are successful in raising young in rimless nests. Most eggs are dirty white with brown or maroon markings, some are simply brown in colour.

Incubation requires six weeks, both parents taking part in the process. Young are fed by regurgitation, and by June or July are ready to leave the nesting area.

The courtship dance of albatross is a ritualistic procedure, that of the Laysan is described by Fisher, in Bent (1922), "At first two birds approach one another, bowing profoundly and stepping heavily. They swagger about each other, nodding and courtesying solemnly, then suddenly begin to fence a little, crossing bills and whetting them together, sometimes with a whistling sound, meanwhile pecking and dropping stiff little bows. All at once one lifts its closed wing and nibbles at the feathers beneath, or rarely, if in a hurry, quickly turns its head. The partner, during this short performance, assumes a statuesque pose, and either looks mechanically from side to side or snaps its bill loudly a few times. Then the first bird bows once and, pointing its head and beak straight upward, rises on its toes, puffs out its breast, and utters a prolonged, nasal *ah-h-h-h,* with a rapidly rising inflection and with a distinctly 'anserine' and 'bovine' quality, quite difficult to describe. While this 'song' is being uttered, the companion loudly and rapidly snaps its bill. Often both birds raise their heads in air and either one or both favour the appreciative audience with that ridiculous, and indescribable, bovine groan. When they have finished they begin bowing to each other again, rapidly and alternately, and presently repeat the performance, the birds reversing their role in the game or not. In the most successful dances the movements are executed in perfect unison, and this fact much enhances the extraordinary effect."

Food

From most accounts it seems the food of this and other species nesting in the northwest Hawaiian chain feed almost entirely upon squid while on the nesting grounds. The population of sea birds from the island of Nihoa alone is estimated to consume at least 600 tons of squid daily. Away from the breeding area (where no doubt squids abound in enormous quantity) this albatross is probably opportunistic, taking whatever nature provides.

Migration

This species, like other albatross, disperses widely over the seas, returning to the nesting islands at the onset of the breeding season.

BLACK-FOOTED ALBATROSS

Description

The black-footed albatross is a large, brownish-grey bird with very long, narrow wings. It measures only to 36 inches (91.3 cm.) from bill to tail, but has a wing span of up to 7 feet (2.1 m.). The bill is brownish in colour, heavy, hooked, and with two grooves running forward from small tunnel-like nostrils. The feet are black, with two toes webbed. Plumage is somewhat gull-like, with tail feathers relatively short. Some adult birds are white at the base of the bill and on the rump. Sexes are coloured alike.

This bird, known as the "gooney" or "gony" to seafarers, is easily identified at almost any distance by its size, colour, silhouette, and flight. The flight consists mainly of gliding, with occasional flapping low over the water, flaring now and then to bank and turn.

Range and Variation

Like other albatross, this is a bird of the open sea coming ashore only to nest. It occurs throughout its range in only one form. Nesting is confined to the Pacific Ocean north of the equator on islands in the Hawaiian group, the Leewards, the Marshalls, and on Marcus, Johnston, and the Volcano Islands. Off the breeding islands the species ranges over wide reaches of the Pacific from the latitude of southern California north to the Bering Sea and west to the coast of Japan. It is seen in numbers off the British Columbia coast during the summer months.

Voice

On the open sea this bird is usually silent, except when quarrelling over food. It then makes a kind of braying or groaning noise. On the breeding grounds, courtship behaviour involving a "dance" is associated with vocal sounds described, in Bent (1922), by Dill

as softer than those of the Laysan albatross and end "with a sound like the shake of a bell under water or deep within the bird's stomach."

Black-footed albatross.

Nesting

The islands upon which this species nests are north of the equator, but the breeding season is similar to that of Southern Hemisphere nesters, that is during our winter months. Eggs are deposited in November and hatch after an incubation period of six weeks, in which both parents participate. One large, white egg, sometimes speckled in reddish-brown, is laid in a shallow depression in the sand, usually close to the beach. Young require some six months to develop sufficiently to fly and leave the nesting islands. In first year plumage, young resemble the parents but are darker and lack the white colour on face and rump.

Food

On the breeding ground, cast pellets indicate that the food of this bird consists largely of squids which are taken on or near the surface at dusk. Most feeding, however, seems to be done on the surface. Albatross are likely opportunistic and will take any floating animal matter such as fish entrails, dead fish, leavings from whaling operations, and the like. However, the sea is a good provider and no doubt these large birds are adept at securing food such as live squid, sandlance, and herring.

Migration

Migrations seem to consist of a wide dispersal over the North Pacific Ocean between breeding periods.

NORTHERN FULMAR

Description

The northern fulmar measures 17 to 21 inches (53.3 cm.) long and resembles a short, medium-sized gull. Most seen in British Columbia waters are grey in colour phase. The bill is short, stubby, yellowish in colour, and tube-nosed. The wings are somewhat narrower in relation to body size than are those of gulls. The flight is definitely that of the tube-nosed swimmer, gliding with alternate short periods of rapid wing beat. The latter characteristic readily separates this species from any gull. Sexes and young of the year are coloured alike. Dark-phase fulmars may be mistaken for sooty or slender-billed shearwaters, but are lighter in colour and decidedly

Northern fulmar.

more stocky, having thicker necks and bodies. White-phase birds are sometimes confused with medium-sized gulls, but may be separated by flight characteristics.

Range and Variation

The northern fulmar breeds on islands in the North Atlantic and North Pacific in both the new and old worlds. None is known

to breed in British Columbia. The breeding islands are to the north in Siberia, the Homandorskie and Kuick Islands of Asia, and on the Aleutian and Pribiloffs and others of North America. Apparently, most of these populations remain in northern waters the year around, but appreciable numbers wander down both sides of the Pacific, to California on this side, and to Japan on the Asiatic side.

In British Columbia these birds are not uncommon along the coastline and on pelagic waters in fall, winter, and early spring.

Three subspecies of the northern fulmar occur, two in the Atlantic, one in the Pacific. These are similar in appearance, and easily identified as fulmars wherever encountered.

Voice

I have seen many fulmars on the open sea and along the shores but have yet, for certain, to hear one make a sound. According to reports of feeding concentrations made up solely of fulmars, distinctive sounds are made. Peterson (1961) describes the voice of this bird as "a hoarse grunting ag-ag-ag-arrr or ek-ek-ek-ek-ek." Elsewhere it has been described as a "sort of chuckling sound somewhat resembling a low grunt."

Nesting

This fulmar is a communal nester, breeding in large numbers on cliff faces. It lays one white egg in a nest sometimes made up of vegetation, mainly grass, sometimes a mere depression in the turf, often no nest at all. The period of incubation is from 50 to 60 days. Both parents are said to partake in incubation, care, and feeding of the young. Feeding is by regurgitation of a clear, oily fluid, the digested product of parental efforts at sea. Nesting begins in late May and June. Young grow rapidly and in about six weeks have replaced the white natal down with first annual plumage.

Food

I have seen fulmars with large feeding concentrations of gulls and murres all feeding avidly upon sandlance in some instances, small herring in others. They are reported to feed upon crustaceans, carrion, and offal from fishing and whaling vessels as well.

Fulmars have been observed diving for food to depths of 2 or 3 feet. Probably this species is as versatile a feeder as are other ocean-going birds, and will feed upon whatever nature presents. There is one account of them eating jellyfish.

Migration

Most of the populations are said to be sedentary, remaining in northern seas not far from the nesting areas. However, there are definite fall and spring migratory movements southward as far as Baja California on the Pacific Coast of North America with return movements northward in the spring.

PINK-FOOTED SHEARWATER

Description

The pink-footed shearwater measures about 20 inches (50.8 cm.) from nose to tail. It is the only white-billed, dark-backed shearwater of this size in British Columbia waters. The white-bellied New Zealand shearwater has a grey back, while the black-vented shearwater, although black above and white below, is much smaller, measuring only 12 to 15 inches (38 cm.). The other three shearwaters occurring off British Columbia have dark breasts.

All shearwaters have long narrow wings and distinctive flight; a rapid beating of wing followed by a period of gliding. In the pink-foot the beating of wing is slower than in the more common sooty shearwater, and the gliding or scaling usually sweeps higher above the surface of the sea. This enables one to identify the pink-footed shearwater at distance.

Range and Variation

These birds nest on Mocha, Juan Fernandez, and other islands off the coast of Chile. They forage north and south when not breeding, most of them remaining south of the latitude of San Francisco. A few straggle northward to Alaska and appear in small numbers off the British Columbia coast during the summer.

The pink-footed shearwater occurs in one form throughout its range; there are no subspecies.

Sooty Shearwater

Scaled Petrel

Pale-footed Shearwater

Slender-billed Shearwater

Pink-footed Shearwater

Manx Shearwater

New Zealand Shearwater

Voice

There is little reference to the voice of this bird in the literature, apart from an account by Murphy (1936) of "peculiar growling barks" recorded on the breeding grounds by Reed. The few that I have seen and collected were silent, but no doubt this bird is capable of producing a variety of vocal sounds as do others of the family.

Nesting

Having never been on the breeding islands of any shearwater, I must refer entirely to the literature, chiefly from several authors quoted in Bent's *Life Histories* and Murphy's *Oceanic Birds of South America.*

Breeding takes place on several islands off the coast of Chile where burrows are excavated in the soil. Some burrows extend to well beyond 10 feet (3.04 m.) and are too deep to excavate by pick and shovel. The single white egg is laid, usually on bare ground, at the end of the burrow. Egg-laying begins in December, with young present in the burrow in January. The birds come to the breeding islands at night, both parents taking part in incubation and feeding of young. Young remain in the nest until fully grown, as do the young of other petrels and shearwaters. They are then abandoned in the burrow and find their way to the sea alone.

Food

Squid, sandlance, herring, and other small schooling fishes are taken by this and other shearwaters. Food is taken from the surface and by diving.

Migration

These birds are seen here in the summer months but are said to be present throughout the year off the California coast. The latter are probably immature nonbreeding individuals. A main northward movement seems to take place in summer and fall.

PALE-FOOTED SHEARWATER

Description

The pale-footed shearwater is a large, dark, brownish-grey bird measuring about 20 inches (50.8 cm.) from bill to tail. It differs

from the more common sooty in being larger and having a larger bill, which is pale in colour. It differs also in having flesh-coloured feet and dark underwings. The flight pattern is slower than that of the sooty shearwater, somewhat like that of the pink-foot. These distinctions are readily seen in the field and serve to identify this locally uncommon bird at once.

Range and Variation

This species nests on islands off the south coast of Western Australia and the north island of New Zealand. It migrates northward sparingly during our summer (June to August) as far as the Goose Island Banks, between Cape St. James and the Goose Islands, the only area from which it has so far been recorded in British Columbia. There are a few records from off Cape Flattery, the Oregon coast, and more off the California coast. Apparently the majority remains in southern seas. The species is monotypic; only one form occurs.

Voice

Noisy on the breeding grounds according to Murphy (1936), where it emits a variety of calls associated with courting behaviour. It was silent on the Goose Island Banks where I observed and collected it (Guiguet, 1953).

Nesting

The pale-footed shearwater sometimes comes ashore on the breeding grounds of Australia and New Zealand during the day, but most of the activity is noctural as it is with other members of this family of birds. The birds return to the breeding islands in September to excavate burrows. "By early November the entire population seems to be coming ashore every night, and laying begins late in this month, continuing until about December 10. A single, large, white egg is laid. The first chicks hatch shortly before the middle of January and half-grown nestlings have been found on March 10. Thereafter the chicks begin to feather rapidly and are fed less frequently, or not at all. By the beginning of May all the burrows are empty and no more flesh-footed shearwaters are to be seen in coastal waters" (Murphy, 1936).

Food

Specimens collected on the Goose Island Banks were without food in the digestive tracts (Guiguet, 1948). However, these birds were easily attracted to the boat with bits of fish liver and offal, indicating that they are carrion-eaters. Main food in the area was sandlance and herring, which were fed upon by the entire avian community, including this species. In southern waters small fishes and squids are eaten (Murphy, 1936).

Migration

Remains largely in southern seas, but migrates as far north as the Goose Island Banks off the British Columbia coast. It is present there in June through August.

NEW ZEALAND SHEARWATER

Description

This bird is referred to as the grey-backed shearwater in many publications. It is a medium-sized, white-bellied shearwater that measures about 17 inches (43.2 cm.) from bill to tail. It is easily distinguished from the other two white-bellied shearwaters that occur in British Columbia by a grey instead of a black back. This contrasts sharply with the birds' black head, wings, and tail. Further, the pink-footed shearwater is noticeably larger than this species, and the black-vented is noticeably smaller. The other shearwaters so far recorded off British Columbia have dark bellies.

Range and Variation

The New Zealand shearwater's breeding range is confined to three small islets off the coast of the North Island, New Zealand. When not on the breeding grounds it ranges eastward to South America and north, sparsely, to California, Oregon, Washington, and British Columbia. The species was first recorded off the British Columbia coast by Nichols on August 7, 1926. Occurrence off Point Pinos, California, where most North American records have been secured, is in late fall and winter (Murphy, 1936). British Columbia specimens were collected in August and September (Campbell, 1971). M. L. Guiguet (1971), engaged in commercial

fishing operations in pelagic waters off Kyuquot and Cape Cook, reported the daily occurrence of the species during the first 10 days of July 1971.

Voice

According to Falla (Murphy, 1936), this shearwater makes low mewing noises when approaching the nesting grounds after dark.

Nesting

This shearwater, like others, comes to the breeding island only at night. As with many other species of sea birds this nocturnal behaviour has probably evolved through pressure exerted by predatory birds, probably hawks and gulls, that once or still do occur in the vicinity of the breeding islands.

According to Falla, the birds arrive in thousands on the breeding island during late August and September. The author assumes this is to establish territory, as excavation of burrows and the gathering of nesting material (many species use no nesting material) does not begin until October and continues until mid-November. The female lays a single, white egg, usually in December. Young in natal down are present in February and most fledglings have left the burrow by the end of March. Waters around the nesting colony are then devoid of shearwaters until the next breeding season.

Migration

East from the breeding areas in March and April to South American waters and north sparsely to the latitude of southern British Columbia. Returning to the breeding colonies in late August and September. It is likely that birds taken in northern waters during this period are nonbreeding individuals.

SOOTY SHEARWATER

Description

The sooty shearwater measures from 16 to 18 inches (45.8 cm.), bill to tail. In August when the moult is complete, or nearly so, the bird is dark grey and the white on the underwing is pronounced. Earlier, when in old plumage, it is brown in colour. At

distance in both plumages, it appears black. Sexes are coloured alike.

The sooty shearwater skims over the sea in typical stiff-winged shearwater flight, a brief, rapid beating of wings followed by a period of gliding. It often travels in very large flocks, differing in this respect from other shearwaters here, which usually occur in much smaller numbers. The sooty shearwater occurs in the hundreds of thousands at sea and sometimes is seen from our outer coastlines, especially in the fall when the birds are heading south to nest.

Range and Variation

This species nests on islands off the Tasmanian and New Zealand coasts and on the Falkland Islands and smaller islands off southern South America. When not nesting, beginning in May, it ranges north throughout the Atlantic Ocean from Greenland to South Africa and, in the Pacific, north to the Aleutian Islands and Alaska in the east and to the Kuriles and Kamchatka in the west. In British Columbia this species has been recorded from May through October, and in California during every month of the year.

There are no known differences between South American breeding populations and those of Tasmania and New Zealand.

Voice

Reynolds, quoted by Murphy (1936), reports this bird as very noisy when breeding. Apparently the noise is deafening when hundreds of thousands of individuals arrive on the breeding-grounds.

At sea it is usually silent, but does make a variety of squeals and gutteral calls when in feeding concentration. At night it is said to make a call note expressed as "tee-tee-tee," from which the Maori name for the bird is derived.

Nesting

The sooty shearwater is nocturnal in its nesting habits and like other small turbinares it excavates a burrow in which to deposit the single white egg. According to Reynolds, in Murphy (1936), burrows on breeding grounds near Cape Horn are reported to

extend from about 3 feet (1 m.) to several yards in length. They are usually found on steep ground at 500 feet (152 m.) or more above the sea, with entrances well hidden under stunted trees. The species is said to nest also on islands with little cover or vegetated only with tussock grass. Nesting chambers are heavily lined with dry leaves, grass, and sticks according to Falla in his studies of New Zealand breeding colonies. Egg records for colonies off New Zealand are listed from November to April, and off Cape Horn in December and January (Bent, 1922). The period of incubation is not given.

Apparently the sooty shearwater behaves much like other species, the majority coming to the breeding islands in October and gone, young and all, by the following May.

Food

Food of the sooty shearwater in the Atlantic and in southern seas consists of a variety of animals, including squids, swimming crustacea, various crab larvæ, and several species of fishes (Murphy, 1936). In the Pacific it eats sandlance, herring, squids, euphasid shrimps, and offal from fishing-boats and the leavings of feeding cetaceans.

The sooty shearwater (and probably all shearwaters) is capable of diving and securing fish by underwater pursuit. I have observed them taking "balled up" herring and sandlance in this manner. Like many other divers, these birds use the wings in underwater locomotion.

Migration

These birds move from the breeding grounds of New Zealand and South America throughout the Pacific and Atlantic Oceans twice a year, spring and fall.

SLENDER-BILLED SHEARWATER

Description

The slender-billed shearwater (sometimes named short-tailed shearwater) measures about 14 inches (35.5 cm.) from bill to tail. It is smaller than the sooty shearwater, but closely resembles that

bird, especially at distance. Both appear simply dark, almost black. Sexes are coloured alike in this species, as with other shearwaters. The slender-billed shearwater has dark and light colour phases. Both are relatively dark, but one shows whiter underwings, which leads in confusing this species with the sooty shearwater. Plumage in both phases has lighter areas about the throat and eyes. Legs and feet are black.

Range and Variation

This bird nests on "coastal islands off South Australia, Victoria, and Tasmania, including Bass Strait and on the Bounty Islands." When not nesting it ranges widely over the Pacific Ocean, probably more along the Asiatic and northern reaches in spring and summer than on the Canadian side. In fall it is abundant off the California coast. In British Columbia this bird is said to be sometimes locally abundant on pelagic waters in the fall. The late Ronald Stewart, of the Queen Charlotte Islands, reported it in vast numbers off the mouth of Masset Inlet in the fall of 1945 (Guiguet, 1946).

I have recorded this bird six times, all on the Goose Island Banks, collecting only one (Guiguet, 1953). I have never identified it positively off the Queen Charlottes or off the west coast of Vancouver Island in many months of summer collecting. Apart from those mentioned here, P. W. Martin (1969) does not mention the species in his recollections of bird observations taken off the British Columbia coast from 1946 to 1949.

This species, like the sooty shearwater, occurs in unbelievable numbers. Flinders, in Murphy (1936), calculated that 150,000,000 slender-billed shearwaters passed his point of observation on Bass Straits in the space of one and one-half hours. Other observers in the same area record even larger concentrations—some that took the greater part of the night to pass a given point.

This species and the sooty shearwater are harvested on the rookeries off New Zealand and Australia. They are known commercially as mutton birds and are salted and canned. Some 250,000 have been harvested annually on some rookeries. A man and wife team alone accounted for 56,000 birds in one season.

There is no significant geographical variation apparent in this species.

Voice

The few birds that I have observed on the open sea were silent. Murphy (1936) writes of the species on the breeding rookeries: "The din that they make can never be forgotten. The incessant sounds are variable but always harsh and unearthly." This is early in the season when courtship is in progress and when they are flighting in to the breeding rookeries at night. Murphy continues: "The departure of the shearwaters at the first streak of dawn is, however, as uncannily silent as the arrival is clamorous." Later, after the chicks are hatched and are being fed in the burrows, parent birds are silent when coming in from the sea "but presently the ground begins to emit extraordinary gurglings, groanings, and laughter, as the hundreds of thousands of chicks are receiving their one meal during the twenty-four hour period."

Nesting

In breeding behaviour, the slender-billed shearwater is much like other shearwaters. It is nocturnal, burrow nesting, arrives at the nesting islands in late September and October, and has returned to the sea, young and all, by the following May.

The single white egg is laid in November and hatches after an incubation period of about 50 days (Murphy, 1936). Both parents are said to take part in incubation and feeding of young. Young are abandoned in the nest when fledged, and find their own way to the sea alone.

Food

Food of this species is said to comprise small swimming crustaceans commonly called "brill" or "whale feed." The birds are often observed foraging with feeding whales (Bent, 1922), an activity indulged in by many other species of sea birds. Because of this activity, slender-billed and sooty shearwaters are called "whale birds" by commercial fishermen.

Migration

Spring migration from the breeding grounds off Australia and New Zealand in May and June is northward mainly along the Asi-

atic side of the Pacific and extends to the Aleutian Islands and northern Alaska. In fall the birds are said to be abundant in southward migration off the California coast.

MANX SHEARWATER

Description

The Pacific race of this species is commonly called the black-vented shearwater. It is a relatively small species, measuring from 12 to 15 inches (38.2 cm.) in total length. Sexes are coloured alike, simply sooty black above and white below, with some mottling on the sides of the head. Underwing coverts and axillaries are largely white. The bird resembles the pink-footed shearwater in plumage colour, but is much smaller, has a black instead of a pale bill, and has a more rapid wing beat.

Range and Variation

The Pacific race breeds on Guadalupe, San Benito, Natividad, and Asuncion Islands off the coast of Baja California, and possibly also on islands in the Bay of California. When off the breeding grounds it ranges sparsely to waters off southern British Columbia, where two specimens have been recorded in October and November of 1891. It has been observed sparingly by various workers over the years, north to the Goose Island Banks (Guiguet, 1953). The limited range of this species in the Pacific is in marked contrast with those of its larger southern relatives, some of which range from southern Australia and Tasmania to the Aleutian Islands and beyond.

The similar-appearing Atlantic subspecies has a wide breeding range extending from Bermuda, Salvage Island, and the Azores to the Ægean Sea, the coast of Brittany, the British Isles, the Færoes, and Iceland. Off the breeding grounds it wanders to southern Brazil (casually to Argentina), Syria, Palestine, Egypt, Canary Islands, Portugal, northern Spain, Denmark, and Norway. Thus it occurs over much more of the Atlantic Ocean than its western counterpart does over the Pacific.

This shearwater is said to occur more frequently closer to shore than do the other shearwaters in the Northern Hemisphere.

Voice

Described by Lockley, in Murphy (1936), the general phrasing of the common call of the Manx shearwater is "kuk-kuk-kuk—oo." During courtship on the nesting islands a variation of calls is heard, apparently enabling individuals to recognize their mates. "The character necessary for recognition appears to be inherent in the voice and, even to human ears, there is an almost infinite individual variation in tone or pitch—some birds have high notes, some low, some harsh, and others soft."

Nesting

Lockley made an intensive study of the nesting habits of the Manx shearwater, including the desertion of young by the adults. Apparently the adults forsake the young one when it is completely feathered and has attained full size. This happens about 60 days after the egg has hatched. After six days of fruitless waiting for parental return with food, the young begin to venture short distances from the burrow, finally walking or flying down to the sea after 11 or 15 days. Hunger, no doubt, finally prompts them to leave the island. At sea they are immediately capable of diving and swimming underwater, the wings being utilized. "Such a plan of life history as worked out by Lockley is doubtless applicable to many species of the genus, and in part to less closely related tube-nosed swimmers."

Like others of this group, the Manx shearwater lays only one egg, which is white. Period of incubation is 52 to 54 days. The egg is laid at the end of a burrow which may extend to 10 feet on islands bearing soil, and in shorter natural recesses on soiless islands composed of volcanic rock. Activity is nocturnal. The birds arrive on the breeding grounds beginning in February, eggs being present in the burrows during April. By August and September, the breeding cycle is completed and nesting islands deserted.

Food

The principal food of the Manx shearwater is said to be small fishes. Anthony, quoted in Bent, records herring, and states that he has never seen this species take garbage or offal thrown from the

deck of ships. Food in Atlantic birds recorded by Jeperson, in Murphy (1936), consisted of fishes, mainly young herring and small cephlapods, probably squids.

Migration

Two migrations annually are listed, a main flight northward that occurs in August and September, and the return flight in February, March, and April.

SCALED PETREL

Description

The scaled petrel is a medium-sized bird measuring about 14 inches (35.5 cm.) in length, similar in size only to the Manx shearwater in British Columbia waters. Adults differ greatly from that species in being much paler above and in having a white chest in sharp contrast with a dark belly. There is also a distinctive, sharply defined black stripe along the leading edge of the white underwing. There is readily apparent individual variation in this species which at one time led to the description of several species.

Range and Variation

"Breeds in New Zealand (the Snares, islets around Steward Island, Preservation Inlet, and Puysegur Point, South Island, Cuvier Island, Maungapohatu Mountain, and other inland ranges, North Island) and on the Bounty and Chatham Islands. Now considerably reduced, at least in the Interior of North Island, New Zealand. Ranges in the Pacific Ocean from near the Antarctic circle (from lat. 68° S.) north to the Aleutian Islands (Kiska), the south coast of the Alaska Peninsula, Kodiak Island, and near Sitka."

According to the American Ornithologists Union (1957), only one race of the scaled petrel is now recognized.

Specimens are yet to be collected in British Columbia, although photographs have recently been taken of a specimen that flew aboard ship (Campbell, 1971). Since the bird was recorded in numbers in Alaskan waters as early as 1911, only the lack of collectors has excluded it from the list of Canadian birds.

Voice

We have no information on the sounds made by these petrels, either on the breeding grounds or in British Columbia waters.

Nesting

Like others of its kind, the scaled petrel is a nocturnal burrow-nester. It lays but a single white egg in December and January. Little information is available here on details of the nesting behaviour of this species.

Food

Probably feeds on small crustanceans and fishes as do other birds of this kind.

Migration

From the breeding grounds of New Zealand south of the 68th parallel and north to the Aleutian Islands, being present off North American shores during our summer months. The records are for the month of June.

LEACH PETREL

Description

This petrel is known as the boreal, and Beale petrel in the Pacific. It measures 8 inches (20.2 cm.) in total length and is easily recognized in being all black with a white rump. Sexes are coloured alike. In flight, this dainty bird has a light, aerial swallow-like appearance. However, the few rapid wing beats followed by a glide is typically tube-nosed swimmer.

As only two species of these small swimmers occur in British Columbia, one very dark and one very light in colour, identification is easy.

Range and Variation

The Leach petrel breeds on islands from northern Japan, the Kuriles, Komandorski Islands, and Aleutian Islands southeast along the Pacific Coast to Baja California; in the Atlantic Ocean from southern Labrador, Iceland, and the Færoes south to Massachusetts and Eire. Ranges in the Pacific to the Galapagos Islands, and in the Atlantic to the Equator and occasionally the Gold Coast and South Africa.

Leach petrel.

In British Columbia this species has been recorded nesting on the following islands: in the Queen Charlottes, Cox, Tian, Ogilvie, Queen, Mackenzie, Rankine, and Bolkus Islands; off the coastal Mainland and Vancouver Island on Storm Island, Moore Islands,

Tree Islets, Pine Island, on the Buckles, Triangle Island, Solander Island, Cleland Island, and the Seabird Rocks (Drent and Guiguet, 1961). In fall and winter it forages on pelagic waters and is not seen on the inside passages as commonly as is the fork-tailed petrel.

Five subspecies of Leach petrel are recognized in North America. These are so similar in appearance that description is not warranted here.

Voice

Soft squeaking and purring sounds are heard when this species approaches the breeding island at night. I suspect burrow location on these heavily populated rookeries is by sound, the bird in the burrow calling to its incoming mate. Similar sounds, however, are heard at night far out to sea.

Nesting

In British Columbia this species begins nesting late in May, when two parent birds are found in burrows containing no egg, a condition which prevails in June as well. Most burrows contain the single white egg and only one parent bird in July, the other parent being on pelagic waters gathering feed. At night a "swing shift" occurs with birds coming in from the sea to feed the young or to relieve the incubating mate. Most young hatch out in late August, judging from studies on Cox Island, on the Queen Charlotte Islands (Guiguet, 1946–47). Incubation period is estimated at five weeks, similar to that of the Leach petrel in the Atlantic (Bent, 1922). Young are deserted in the nest, as is the habit with these tube-nosed swimmers. They make their way to the sea when fully fledged.

Burrows, like those of the fork-tail, are excavated a few inches below the surface and extend for a few feet parallel to it. The expanded end contains the egg, and sometimes a bit of sphagnum or dry grass as nesting material.

On most islands occupied by this species, burrows are in unbelievable profusion and mixed with myriads of other burrows of fork-tailed petrels and small alcids. Predation by black bears has been observed on nesting colonies on the Queen Charlotte Islands (Guiguet, 1947).

Food

Small swimming crustanceans, mainly euphasid shrimp, are taken by this species in British Columbia waters during the summer months. Bits of fish entrails and offal from fishing-vessels are taken when opportunity provides. I have no records of this or the preceding species capturing and eating fish.

Migration

Not known, believed to winter on pelagic waters, perhaps on those of the "Japanese current." There is no apparent fall inshore movement as with the fork-tailed petrel (1953).

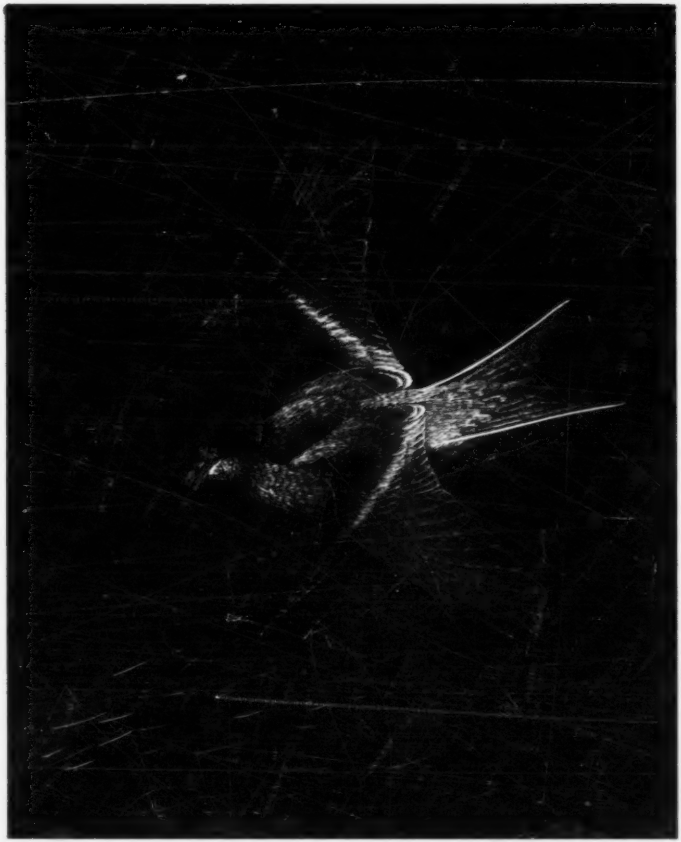
FORK-TAILED PETREL

Description

This small, tube-nosed swimmer measures 8 inches (20.2 cm.) from bill to tail and has a wingspread of less than 12 inches (30.5 cm.). The sexes are coloured alike, pearly grey with black bill and legs. This petrel, like others, is usually found well offshore on pelagic waters. In summer, during the breeding season, it comes only at night to the islands upon which it nests. Sometimes during periods of fog and storm, and in the fall, petrels do occur in inside waters between coastal islands and the Mainland. The flight of the fork-tail, like that of other tube-nosers, consists in part of gliding or scaling, which readily distinguishes it (and the following species) from similar-sized conventional fliers such as phalaropes and other shore birds which may also occur over the sea in migration.

Range and Variation

This species occurs as two similar-appearing geographic races. The northern subspecies breeding range extends from the Kuriles and Aleutian Islands east of Sanak Island. When not breeding, the birds range north in the Bering Sea and south in the western Pacific to Japan. The southern race breeds from the Alexander Archipelago south to northern California. The known breeding range of this race is not continuous. So far in British Columbia it is known from Cox, Langara, Tian, Ogilvie, Queen, and Bolkus, islands in the Queen Charlotte Islands, and on Fingal, Triangle,



Fork-tailed petrel.

Cleland Islands, and the Seabird Rocks off the Mainland and Vancouver Island coasts. Occurrence of suitable soft-soiled, predator-free islets appear to be the limiting factor in the breeding distribution of this and many other species of sea birds.

Voice

The calls of the fork-tailed petrel are harsher than those of the boreal. The differences seemed discernable despite the confusion of numbers at Cox and Cleland Islands when the birds came in at night. Soft cooing calls from the earlier-arriving boreal petrels, contrasted with harsher calls of the fork-tails which arrived later. When taken in hand from the burrow, the fork-tailed petrel emits a soft squeaking alarm note, as it does when taken at sea. Fork-tails are easily baited to the boat, where they will dive for bits of fish liver and are then grasped when surfacing.

Nesting

In British Columbia, nesting is confined to burrows on soft-soiled predator-free islands. Both timbered and islands vegetated only with lesser plants are utilized. Digging is done with the feet. Burrows vary from 2 to 3 inches (7.5 cm.) in diameter and from a foot or two (61 cm.) in extent to 3 or 4 feet (122 cm.), usually not far below the surface of the ground. Burrows are often in profusion, side by side, criss-crossing one above the other. Sometimes as many as four species of burrowing sea birds are found nesting within burrows a few inches from each other.

The single, small, white egg is laid at the end of the burrow, which may or may not contain nesting material of sphagnum moss or grass. Some eggs are faintly marked in minute dark and lavender-coloured markings. Eggs are laid in May, young hatch out mainly in June.

Incubation is carried out by both parents and is of about five weeks' duration. Young are fed in the nest until full grown, when they fly off alone to the sea. Parent birds take shifts, one incubating the egg or tending the young during the day while its mate is off at sea. Before the egg is laid, mated pairs are often in the burrow by day. Copulation probably takes place in the burrow. Young are covered in thick, light-grey natal down. First juvenal plumage resembles that of the adult.

Food

Petrels, both young and old, disgorge a clear reddish or, less commonly, green oily fluid when captured in the burrow. This is

said to be the digested product of small marine crustacea upon which these birds feed. Petrels readily take small bits of offal and have been observed following feeding baleen whales, obviously feeding upon their leavings.

Migration

There seems to be no definite north-south migratory movements. Movements not associated with breeding are probably determined by the availability of food. A movement to inside channels and inlets occurs in the fall (Guiguet, 1953).

TOTI-PALMATE SWIMMERS

This order of birds includes the pelicans and cormorants and is represented in British Columbia by two families of birds made up of five species, two of which are pelicans, three cormorants. These birds have in common four toes connected by webs, hence the name of the order (Fig. 3). Tropic birds, boobies, gannets, darters, and man-o-war birds also belong to this order, but do not occur in British Columbia.

FIG. 3. Four toes webbed.

Pelicans are large birds with long, broad bills and very large distinctive throat pouches. The white pelican grows to 70 inches

(1.76 m.) in length and has a wingspread of up to 9 feet (2.8 m.). The brown pelican is smaller with a wingspread of only 6½ feet (1.98 m.).

Cormorants are smaller than pelicans, appear largely black at distance, and have a vertical stance when at roost. They have very small throat pouches, and in general bear little resemblance to pelicans.

WHITE PELICAN

Description

The white pelican measures 55 to 70 inches (1.76 m.) in length and has a wingspread of up to 9 feet (2.8 m.). Both sexes are white with black wing primaries and with a distinctive long, yellow, heavily pouched, flat bill. Some fully adult birds develop a yellow crest and yellow breast plumes during the breeding season, but most have only a dark cap which extends down the neck and later disappears.

This huge bird appears ponderous on land, but in flight it is very graceful, with a slow, characteristic sailing flight, and an outline that facilitates recognition. The head is carried back on the shoulders, which distinguishes this bird from other white, black-primaried species such as the snow goose, whooping crane, and wood ibis, which fly with neck extended. Young of the year resemble the adults.

Range and Variation

So far as is known, the nesting range of this species in British Columbia is restricted to Stum Lake on the Chilcotin plateau. The bird has been reported to nest on other lakes in this area and northward, but none has been verified. Elsewhere the breeding range extends from the extreme southern Northwest Territories, over a wide range of lakes in the north central Prairie provinces, east to Ontario through the central United States in Montana, west to Oregon, and southward through Texas. The species is casual in summer from southern Mackenzie District (Great Slave Lake) south to Texas, Arizona, Kansas, Nebraska, and Minnesota, and on the coasts of Louisiana and Florida. It winters from north central California, central Arizona, the Gulf States, and Florida south through Mexico and Guatemala.

White pelican.

The white pelican occurs in one form throughout its range; there are no subspecies.

Voice

Mostly silent, except on the breeding grounds, where a medley of calls from a colony is said to produce a considerable volume of noise. The notes have been variously described as "grunting quacks," "a deep-voiced, not loud, murmuring groan," and "low-toned grunts or subdued croaking notes." Probably the young are more noisy than the adults.

Nesting

The white pelican lays from one to three, usually two, white eggs which are said to be brittle and thin-shelled. They are most often nest-stained and dirty. Incubation period is 29 days, with both adults taking part. The young, when first hatched, are without down, blind, helpless, and are fed in the nest from two to three weeks. Young "gang up" after leaving the nest and are covered in heavy white down at that time. They are fed by regurgitation when small and on a "do it yourself" basis when larger. They reach into the parents' gullet (head, bill, and all) to secure their meal. They take readily to the water when at this stage of development.

The Stum Lake rookery has large, downy young out of the nests in July, which places egg-laying sometime in late May or early June. Elsewhere, time of nesting varies with latitude.

Food

Food consists almost entirely of fish which are captured from the surface of the water, not by diving. Apparently these birds are capable of co-operating in securing shoaling fishes. They are capable of handling large fishes as well, and species such as pike, pickerel, trout, and whitefish are listed as prey, as are sticklebacks and other "minnow" class fishes. Salamanders have been recorded as food, and captive pelicans are known to eat meat readily.

Migration

The British Columbia birds migrate southward during September and October, when they have been observed on southern Van-

couver Island, the Gulf Islands, and the Lower Mainland. We have no records for spring migration.

Elsewhere, birds from the northern and central nesting grounds migrate to the southern United States, Mexico, and Guatemala.

BROWN PELICAN

Description

The brown pelican measures 44 inches (1.12 m.) in length and has a wing spread of 6½ feet (2 m.). It, like the white pelican, is a ponderous, heavy bird with the typical pelican outline. The long, pouched bill and characteristic flap and glide flight make identification of these birds easy. Colour separates this species immediately from the white pelican.

The body colour in adults during summer is brown, neck and head largely white, the latter sometimes yellow on top. In winter, adult plumage is similar but there is more white on the hind neck and head. Sexes are coloured alike. Young birds have brown heads and necks.

Range and Variation

The species ranges from south coastal British Columbia, where it occurs accidentally; down along the Pacific Coast to southern Chile, occasionally to Tierra del Fuego, including the Gulf of Panama and the Galapagos Islands; and from the Gulf Coast of the United States southward through the West Indies and along the coasts of Central America and northern South America, casually to extreme northern Brazil.

In British Columbia the brown pelican has been recorded only a few times and at widely spaced intervals. Summer records are from Race Rocks, Queen Charlotte Strait, Island View Beach, and in the winter from Burrard Inlet, Race Rocks, Esquimalt Harbour, Victoria (Guiguet, 1947).

According to the American Ornithologists Union Check-list, the species occurs as three geographic races, two in the Atlantic and Caribbean and one in the Pacific. In North America the Pacific race nests mainly on islands off California and Mexico. Some question seems to exist with the systematic position of Galapagos birds.

Brown pelican.

In the past and in recent years great declines in the brown pelican have been reported. Recent mortality has been attributed to pesticides and other disturbances and encroachments of man. However, great die-offs have been reported before the age of pesticides as early as 1656 and to 1911 by Murphy (1936), with disease and mosquito depradations on nestlings postulated as the causes then.

Voice

Adults are said to be mostly silent, even during courtship. Chapman writes, "a low, husky, gasping chuck is the only note I have ever heard issue from the throat of an adult wild brown pelican." Young birds, however, are very noisy at feeding-time, emitting noises described as grunts, barks, and squeals (Bent, 1922).

Nesting

The brown pelican lays from two to five, usually three, dull-white eggs after a simple courtship ritual. Eggs are laid in large, bulky nests of grasses, sticks, leaves, and other vegetation interwoven with branches of trees in which they nest. Where trees are not available, nests are built on the ground, sometimes bulky, sometimes sparsely constructed.

Incubation is of four weeks' duration. Eggs and young are tended by both parents, the young being fed regurgitated food from the bill of the adult. Young remain in the tree nests until nearly ready to fly, but those on the ground wander about in large droves, mobbing any adult that arrives with food. Adults apparently recognize their own young and beat others off.

Food

I have not observed either nesting behaviour or feeding of this species other than on film. The spectacular aerial diving ability is remarkable in such a large, apparently clumsy, bird. Dives are made from heights of 10 to 50 feet above the water, the height said to be governed by the depth at which the prey (various species of fish) is swimming. Outstretched necks and partially folded wings initiate the dive, which is said to be always down wind, and though awkward in appearance usually successful. The bird emerges

facing up wind with its prey, which facilitates take-off. The pouched bill is drained by down-tipping and the fish is swallowed by up-tilting, before take-off (Murphy, 1936).

Migration

The Pacific subspecies wanders northward, after breeding, to northern California and very rarely to southern British Columbia. It ventures southward to Colima, on Mexico's west coast, and accidentally inland in Arizona and California.

DOUBLE-CRESTED CORMORANT

Description

This cormorant measures up to 36 inches (91.4 cm.) in total length. In full plumage it is readily distinguished from the other two species by a bright-yellow throat patch; the double crest is seldom apparent. The others have blue and red throat patches respectively. The adult plumage is mainly shiny, greenish-black; sexes are coloured alike and breeding adults, for a brief period, sometimes have two small tufts of white feathers on either side of the head. Young of the year are dark brown with light-coloured breasts and dark bellies. This, like other cormorants, has an upright position when at roost; it flies with the head above the horizontal; and has a rapid distinctive wing beat.

Range and Variation

This species has a wide range in North America. It occurs from southwestern Alaska, coastal British Columbia, central Alberta and Manitoba, James Bay, the Gulf of St. Lawrence, and Newfoundland, south to the Revilla Gigedo Islands, Baja California, Guerrero, Cuba, Florida, and the Bahama Islands; in winter to British Honduras.

Over this range it occurs as three subspecies or geographic races that are very similar in appearance. The race occurring in British Columbia has been known to nest on Mandarte Island, the Ballingall Islets, Christie Islet, the Channel Islets, Admiral Island, and the Red Islets (Drent and Guiguet, 1961). Elsewhere it breeds southward along the Pacific Coast of the United States and Baja California and in the Interior of Oregon, California, Nevada, and Arizona.

Double-crested cormorant.

Voice

Usually silent, except on the breeding grounds, where a variety of sounds is made during courtship. Godfrey (1966) describes them as follows: ". . . a series of oak, oak, oak, sometimes dwindling to tick-tick-tick; a loud hawk; a louder r-r-r-o-o-o-p; a variety

of croaks; young during and shortly after hatching, weet-weet-weet; more mature young have a variety of high-pitched squeaking notes."

Nesting

In British Columbia the nests of this species are located in trees or on the ground. They are large, some almost 2 feet (60.9 cm.) in diameter. They are constructed of sticks, roots, and branches and lined with grasses, seaweeds, and such shore-side materials. Clutch size varies from three to five chalky blue eggs, most of which are laid from mid-April to late May. Incubation is shared by both parents and is of 28 days' duration. Sometimes two broods are raised a season in the southern part of the range; the second egg-laying taking place in early August.

Young, born blind and naked, grow quickly, and the early hatches are gone from the breeding islands in late September, having been fed by regurgitation until six or seven weeks old. At that age they are capable of fishing on their own.

An excellent comparative study of the life histories of this and the pelagic cormorant nesting in British Columbia made by G. F. van Tets on Mandarte Island (1959) is referred to in this text.

Food

Cormorants along the British Columbia coast feed entirely upon fish. Herring, sandlance, sculpins, and blennies are the most commonly eaten. These are captured in underwater pursuit and by probing under rocks on the ocean floor.

Migration

The double-crested cormorant occurring in British Columbia is largely resident, remaining in most of the breeding range the year round.

BRANDT CORMORANT

Description

The Brandt cormorant is about the same size as the double-crested, measuring from 28 to 35 inches (88.9 cm.) in length. It

differs noticeably from other British Columbia cormorants in having a blue throat pouch margined by brownish plumage which contrasts sharply with the dark head plumage. The others have yellow and red throat pouches respectively. Adult plumage is largely iridescent black. Narrow white plumes on each side of the head and sometimes on the back are retained for a brief period early in the breeding season. Young of the year are mainly dark brown, darker on head, rump, and tail and with a light patch behind the throat pouch.

Brandt cormorant.

Range and Variation

Breeds along the Pacific Coast from Vancouver Island (possibly some years on the Gosling Rocks and Solander Island, certainly on the Sea Lion Rocks, Florencia Island, and Great Bear Rock (Stirling, 1966), (Campbell, 1970)) and along the Pacific Coast from Washington (Matia Island) south to Natividad Island and Gull Rocks, San Cristobal Bay, Baja California; also on San Pedro Martir Island, and Roca Blanca near Isla Portida, Gulf of California.

It seems apparent that Brandt cormorant sometimes shift newly established nesting colonies from one area to another from year to year. It appears that the British Columbia rookeries off Tofino and in Barkley Sound have only recently been established and are subject to this phenomenon.

The Brandt cormorant is monotypic, occurring in one form throughout its range.

Voice

I have not heard this bird make a sound on the breeding rookery or elsewhere.

Nesting

The Brandt cormorant breeds on islands, where it builds foot-high nests almost entirely of fine eel-grasses. It lays from three to six eggs, usually four, but loses some to crow and gull predation. The eggs resemble those of other cormorants, being pale blue with white calcareous markings. Period of incubation is probably 28 days, like that of the double-crested cormorant. Egg-laying thus would begin in mid-June or the third week in June as young begin to hatch out in mid-July on the British Columbia colonies.

Food

Like that of other cormorants, food of this species is comprised of fish taken in underwater pursuit. I have often observed cormorants working underwater and have yet to see one using the wings. Powerful thrusts of the fully webbed feet propel these birds efficiently.

Migration

The American Ornithologists Union Check-list of North American Birds indicates this species as resident on its breeding ground; however, a large, purposeful migration of thousands of Brandt cormorant occurs throughout the month of August, moving northward along the British Columbia coast, where it has been recorded annually from 1964 to 1971 by Provincial Museum field parties (Guiguet, 1971). Destination and origin of these birds is as yet unknown, but it is obvious that they come from the large rookeries to the south. Martin (1969) reports a definite southern spring migration of this species along the west coast of Vancouver Island.

PELAGIC CORMORANT (FRONT COVER)

Description

This is the smallest of the three species of cormorants that occur in British Columbia. It measures to 26 inches (66 cm.) in total length and is slimmer than the other two species. It differs also in having a red throat pouch, and, in the breeding season, a large white patch on either flank. Sometimes the breeding adults have plumes on each side of the neck. In addition there are conspicuous crests on the forehead and crown of adults in breeding plumage. Colour is mainly black with greenish and purple iridescence. Immature birds are mainly dark brown in colour.

Range and Variation

This is the most abundant of the three species of cormorant occurring in British Columbia. It breeds on most suitable locations along the entire coastline from Alaska to Baja California on the North American side of the Pacific; and from the Bering Sea and northeastern Siberia to Japan and southern China. In British Columbia, nesting-sites are so numerous that they are not listed here. Nests occur on the extreme northwestern tip of the Queen Charlottes on Langara Island south to Race Rocks in the Straits of Juan de Fuca and along the east coast of Vancouver Island (Drent and Guiguet, 1961).

Two similar-appearing subspecies occur in the Province. A northern race breeds on the Queen Charlotte Islands and possibly

southward; the other along southern Mainland and southern Vancouver Island shorelines for an undetermined distance northward.

Voice

Like the other cormorants described here, this species is usually silent but does make croaking sounds when on the breeding rookeries.

Nesting

Nests of the pelagic cormorant are built on the ground, never in trees. Where cliffs are present it prefers them and the narrow rocky ledges that such provide. It does, however, nest above the high-tide mark on relatively low reefs (Chain Islands) and in caves (Barkley Sound, 1971) and on man-made marine markers and lighthouses (Fiddle Reef). The nest is built mainly of grasses and marine algæs cemented to the rock by the continued droppings of the bird. The male displays at the empty nest, eventually attracting a female, as does the double-crested cormorant.

Usually four eggs are laid and, like other cormorant eggs, are blue with calcareous deposits. Incubation is carried out by both parents and is of 31 days' duration. Chicks, born naked, are fed by both parents by regurgitation. Young, according to van Tets, leave the nest and gradually attain independence about the sixth or seventh week (Drent and Guiguet, 1961).

Food

This species uses two methods in capturing prey, which includes a wide variety of fish. Schooling, free-swimming fishes such as sandlance and herring are captured in direct underwater pursuit. Blennies, cling fish, sculpins, and the like are seized from under the rocks and other marine cover in which they hide.

Migration

Resident over most of its range, wintering where it breeds. There are definite north and south movements throughout the winter around the south end of Vancouver Island, probably dependent upon food supply.

AUKS, MURRES, AND PUFFINS

Auks, murres, and puffins belong to a family of birds commonly named "alcids" or "short-winged divers." They are strictly sea birds and most species come ashore only to nest, or when oiled or sick. Most species are black and white in colour; all have short, narrow wings, short necks, and short, thick bodies. The bills vary in shape, but all are adapted for seizing small fishes, although most species feed avidly on small shrimp and other small invertebrates as well.

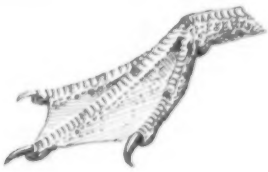


FIG. 4. Three toes webbed, hind toe reduced, claws.

The legs are set well back on the body; three toes are webbed, the hind toe being absent or nearly so (Fig. 4). On land these birds sit up in a penguin-like stance and most appear awkward until in the water. All species are expert swimmers and divers, utilizing the wings to literally fly underwater, where they move with amazing speed and dexterity.

In British Columbia, nine species of this family occur. Most are very numerous on the coast, a few occur but casually.

These birds are vulnerable to predation by land mammals such as mink and black bear. Consequently, the breeding distribution of most is confined to islands free of such predators.

COMMON MURRE

Description

The common murre measures about 16 inches (40.7 cm.) from bill to tail. It is the largest of the short-winged divers (Al-

Common murre.

cids) occurring in British Columbia. The body is compact, neck and head stout; bill sharp and pointed (Fig. 5); wings small, and the tail is short.

This bird is essentially "black and white"; the sexes are coloured alike. In full breeding plumage the head and neck are sepia coloured, appearing black at a distance. The upper parts, wings, and tail are black; underparts snowy white. In winter plumage the back, wings, and tail remain black but the throat and lower

part of the head are white, with only a dark mark on the side of the face (*see* illustration). Young of the year resemble winter-plumaged adults. Birds in plumage appearing intermediate between summer and winter are often seen throughout the year.

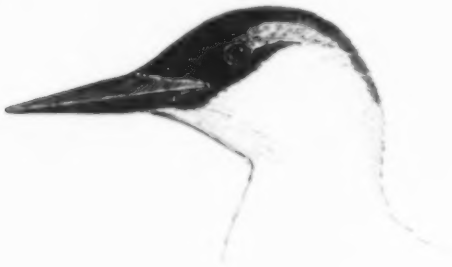


FIG. 5. Common Murre, winter plumage.

Winter-plumaged birds observed in mid-summer, before the current year's hatch leaves the rookeries, probably indicates different age classes. Young of the current year resemble adults in winter plumage.

Range and Variation

This species occurs from the Bering Strait south to Japan on the Asiatic side and south to California on this side of the Pacific Ocean. It occurs also on the Atlantic from Greenland south to Nova Scotia on the Canadian side, and to France and the Mediterranean (winter) in Europe.

In British Columbia it is known to breed in large numbers on Triangle Island in the Scott Island Group off the northern tip of Vancouver Island and at Cleland Island near Tofino, where a few pairs have recently established (Drent, 1970). Small young and adults in the immediate vicinity of Solander Island may indicate recently established breeding there (Guiguet, M., 1971).

Three subspecies or geographic races are recognized. The North Pacific race breeds south to Triangle Island and winters all along the British Columbia coastline. A more southern form nests from northern Washington southward. The Atlantic form is recognized as another geographic race. These races are very similar in appearance and behaviour.

Voice

The calls of the common murre are best described as hoarse notes, murmuring sounds, and sharp gutterals. They have been expressed by various writers thus: "ow-ow," "arry," "kerawk, kerawk," and "arr-r-r-r—orr-r-r-r—err-r-r-r."

Nesting

The common murre is a sea-cliff nester, but on crowded rookery islands it often nests across the flat ground on top. On Triangle Island we found it nesting on the cliff faces for the large part, but numerous birds were also incubating eggs among the grass tussocks atop the cliffs. No nest is constructed by this species; the eggs are laid on the ground.

A single large egg is laid in June. It varies in ground colour from almost white, through a range of green and brownish shades. The eggs are heavily blotched with black markings. Eggs measure about 3¼ inches (8.3 cm.) long and are much larger at one end. This is said to prevent the egg from rolling off the nesting ledge as it will always rotate about the smaller end. Incubation requires about 30 days, after which the young are fed at the nesting-site until partially fledged. At the call of the parent birds the young leave the nesting islands. Those on the cliffs drop from considerable heights to the water, with no apparent damage. Where possible, the young scramble down to the parents, who swim off to the open sea with them (Tuck, 1960).

Food

Food consists mainly of small shoaling fishes which are caught in underwater pursuit. I have observed murres and other alcids working a "ball up" of small herring by swimming rapidly around the mass, adroitly picking off the prey. Whether the birds "ball up"

the herring, or whether this is natural behaviour for such fishes is unknown. I suspect the birds are responsible. In any event it works to the diving birds' advantage, and also to that of surface feeding birds such as gulls.

Sandlance, herring, anchovy, smelts, and other small fishes are utilized, as well as marine crustaceans and small squids.

Migration

During the winter, murres are often seen in large flocks travelling up and down the coast. These movements are apparently associated with feeding or weather conditions. Movements of adults to the breeding rookeries occur in early spring, birds arriving on the British Columbia rookery at Triangle Island probably in March or early April.

THICK-BILLED (PALLAS) MURRE

Description

This species closely resembles the common murre in behaviour and general appearance. It differs mainly in having a larger bill, a different range, and certain plumage differences. The most noticeable plumage difference in summer is the angle at which the dark plumage of the head and neck meet the white of the breast. In the thick-billed murre the angle is more acute than it is in the common murre. In winter the black of the crown comes down over the eyes and ears without a break in the thick-billed murre. In the common murre the spur of white extends from the throat over the ear and behind the eye (*see* illustration).

Range and Variation

Two geographic races of thick-billed murres occur in North America—an Atlantic form and one in the Pacific. The Pacific range extends from Asia to the Pribiloff and Aleutian Islands, northern Alaska south to Kodiak Island. This is the bird commonly called "Pallas murre," and it has been recorded occasionally in British Columbia. There are very few records, but it is suspected this species may winter regularly in northern British Columbia waters, where it may have been overlooked, due to the scarcity of observers.

Thick-billed (Pallas) murre.

Nesting, voice, and food habits of this species are like those of the common murre.

Migration

Apparently this species is largely sedentary.

PIGEON GUILLEMOT

Description

The pigeon guillemot is a chunky bird which measures about 14 inches (35.6 cm.) from bill tip to tail tip. In summer plumage it is simply black with a white patch on the wing. The white wing

patch is interrupted by a black spur, a feature which separates this species from the closely related black guillemot of Atlantic waters. In winter the black plumage is largely lost and replaced by white, so that the bird is vastly changed in appearance (*see* illustration).

The inside of the mouth and the feet of the pigeon guillemot are bright red, in startling contrast to the dark summer plumage. When moulting, spring and fall, the birds have a "salt and pepper" appearance, a blending of black summer plumage with the white plumage of winter.

Pigeon guillemot.

Range and Variation

Two geographic races of pigeon guillemot are recognized. One race occurs along the coast and coastal islands of Pacific North America from the eastern Aleutians, coast of Alaska south to Santa Barbara Island, California. The other race is Asiatic, occurring eastward only to the eastern Aleutian Islands.

Rocky sea shores where broken rock, log debris, and boulder beaches prevail are the favourite haunts of this bird. Unlike other alcids it frequents the shore and shorelines the year round and is often seen perched on the rocks. It is a common bird all along the British Columbia coast.

Voice

The most often-heard sound made by these birds is a soft whistle, heard usually around the breeding colonies and during courtship behaviour. Hissing noises and low chirping noises are sometimes heard when the birds are being disturbed on the nest.

Nesting

One or two eggs are laid in a recess adjoining the sea. Broken rock, very large boulder beach, and sandstone erosions seem the preferred sites. Where such are not available, permanent coastal log jams are utilized. In many areas along the British Columbia coast the birds excavate burrows between the overburden of soil and the substratum of rock along cliff faces overlooking the sea.

The period of incubation is 21 days. Downy young remain in the nest and are tended by both parents, who have also shared incubation. Young are covered in soft, black natal down when hatched. After a period of about six weeks the young take to the sea with the parent birds. At that stage of juvenal plumage they resemble the adult in winter plumage, being more white than black.

Food

Blennies, stickleback, sculpins, and other inshore marine species are very often taken by this bird. Shoaling fishes such as small herring and sandlance are utilized as well. No doubt crustaceans, small shellfish, and other food species are taken when opportunity permits.

Migration

Largely sedentary over the entire range.

MARBLED MURRELET

Description

The marbled murrelet is a small, neckless-appearing sea bird which measures about 10 inches (25 cm.) from bill to tail. The sexes are coloured alike but there is a distinctive plumage change in winter and summer. In the summer the plumage is dark brown, sparsly flecked and margined in white; hence the name "marbled." In winter the bird is white below, near black above, with a white line between back and wing. The dark plumage on the head does not extend to the throat as it does in the ancient murrelet, in which species the white lateral line is absent. Young of the year resemble the parent bird in winter plumage and they appear on the sea toward the end of June. Black-and-white appearing birds seen earlier in the spring and summer with the dark breeding birds apparently are the young of the previous, not the current, year.

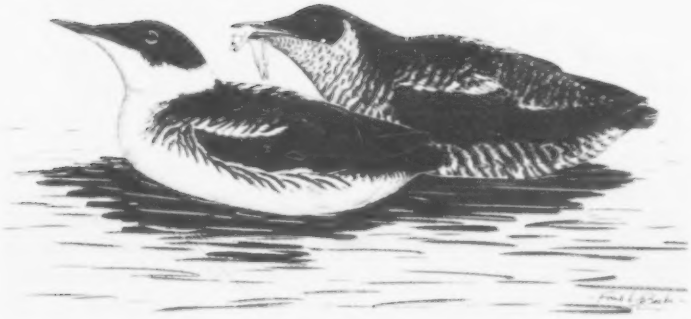
Range and Variation

The marbled murrelet occurs from Japan to Kamchatka on the Asiatic side of the Pacific and from Alaska and Kodiak to northern California on the North American side. It is a bird of the littoral (inshore) waters, seldom seen far out at sea. Occasionally it is seen at night on large fresh-water lakes close to the sea (Barraclough, 1971).

This species occurs without apparent geographic variation throughout its range. In most parts of the range it is abundant and easily observed.

Nesting

The downy young of the marbled murrelet has never been described, for as far as is known, no man has ever seen one. Eggs are known, having been taken from the oviduct of the female. The egg is large and dull, with a pale-green ground colour speckled with dark markings. There are several claims to the discovery of the marbled murrelet's nest, none of which is universally accepted by ornithologists, although tree-nesting is gaining credence. The



Marbled murrelet.

main reason for the inacceptance is the contradictory nature of the claims. Some eggs are said to have been taken from burrows in the ground, others from rock crevices, still others from open river gravels; both eggs and young have been recorded from trees, and from the open forest floor (Guiguet, 1957, 1971). I have examined the eggs from two of these, one said to have been taken from a ground burrow, the other from a fallen tree. Both eggs were definitely those of the marbled murrelet. A young bird from a tree being felled at Holberg, Vancouver Island, was identified as a nearly grown marbled murrelet by ornithologists of the Canadian Wildlife Service at Vancouver (Harris, 1971).

Marbled murrelets are numerous on this coast, and by observing them carefully during the breeding periods we have learned a considerable amount about their breeding behaviour.

The nesting area is usually a long distance from the sea and is visited by the adult birds only at night. Most likely the species nests in small colonies. This is surmised because concentrations of breeding birds are present on the sea at dusk. These birds all seem to take off and follow the same line of flight. When the young

eventually fly down to the sea, they arrive and concentrate in the same areas.

The young are raised at the nesting-site until capable of flight. They arrive on the sea by night toward the end of June, all with the remnants of an egg tooth on the upper mandible and in some cases with wisps of greyish natal down adhering to the juvenal plumage. Period of incubation, of course, is unknown, but is probably comparable to that of similar-sized alcids such as the ancient murrelet, about 21 days.

Breeding birds have but one brood patch and but one young is seen with two adults when the young first arrive on the sea. However, two young are said to have fallen from the tree at Holberg Inlet. In any event, within a few days various combinations of the number of young to adults are seen. Sometimes as many as 8 or 10 young may be tended by only two or three adults.

Fledged young have been picked up, in a variety of habitats, miles from the sea. These were obviously birds incapable of completing the flight from nesting-site to the sea and contribute little but possible line of flight information.

In an area in the interior of Vancouver Island, numbers of birds were observed leaving high cliff faces by loggers working in the very early dawn. One of these birds struck a guy wire and was killed. Unfortunately, the specimen was not preserved, but a description sent to Dr. I. McTaggart Cowan of the University of British Columbia left little doubt that it was an adult marbled murrelet. The following season a Provincial Museum expedition searched the area for three nights during the height of the breeding season. No birds of any description were using the cliffs. This may have been due to disturbances by massive logging operations which had not been in progress at the beginning of the previous nesting season. However, we have noted that breeding concentrations do not occur annually in the same area on the sea year to year. This seems to indicate that the birds may change breeding-sites annually in most areas. Nevertheless, we are aware of breeding concentrations that do occur annually. I have little doubt that a serious effort will reveal the location of the marbled murrelets' nesting-site, and that the story of life history, downy young, and the

rest will follow. To my knowledge this has never been done, but it is nice to have a bird mystery such as this upon which to conjecture.

Food

Like the other divers, the marbled murrelet feeds largely upon small fishes, chiefly sandlance from my observations. No doubt small marine crustaceans and other small fishes are taken as opportunity permits.

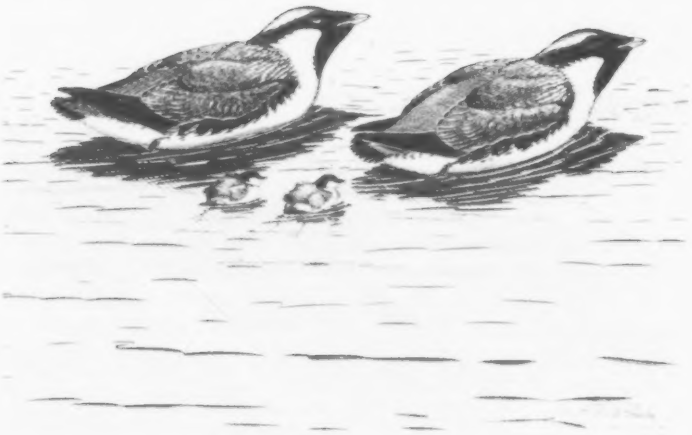
Migration

Along much of the British Columbia coast the marbled murrelet is sedentary, frequenting the same littoral waters the year around. At the extremities of the range is Alaska and in California there seem to be seasonal migratory movements north and south.

ANCIENT MURRELET

Description

The ancient murrelet is a small diver that measures about 9 inches (22.8 cm.) in total length. It has the typical stubby, neckless appearance characteristic of this group of birds. Sexes are coloured alike and there is little plumage difference apparent summer and winter. The top and side of head, throat, and hindneck are black merging to pale bluish on the shoulders and back. Underparts are white with a spur of white extending up the side of the neck. Wings and tail are black. The bird probably gets its name from an irregular bar of white high on the side of the head, which suggests a greying at the temples. The bill is small, somewhat shorter, more curved on top and paler in colour than is that of the marbled murrelet, the only British Columbia bird with which this species may be confused. There is no problem of identification in summer when adult marbled murrelets are brown in colour and their young, though black and white, are small. In winter, however, all the marbled murrelets assume black and white plumage somewhat similar to the year-around plumage of the ancient murrelet, and confusion may arise when the birds are seen at distance. At close range, however, the differences are readily distinguishable.



Ancient murrelet.

Ancient murrelets in juvenal plumage resemble the adult but are less distinctly marked and often lack white bars on the head and the distinctive black throat.

Range and Variation

The ancient murrelet occurs in one form only on both the North American and Asiatic sides of the North Pacific Ocean. It nests southward to Korea on the Asiatic side and from the Aleutian Islands south to Carrol Island off the Washington coast on the North American side. It is far more abundant in the northern part of the range. In British Columbia, nesting has been recorded on the Moore Islands and on the Queen Charlotte Islands where there are known breeding colonies on Langara, Lucy, Cox, Frederick, Hippa, Lihou, Helgesen, Saunders, Reef, Agglomerate, George,

Boulder, and Sea Pigeon Islands. No doubt other unexplored islands also harbour nesting colonies.

The winter range extends as far as Baja California.

Voice

The ancient murrelet utters a short trilling call when on the open sea. A number of chirping notes and shrill whistles are uttered when the birds are on the breeding grounds. Usually it is difficult to hear single calls due to the bedlam produced by thousands of individuals moving on and off the colony at night. When the young hatch and go to the sea, the bedlam increases. Parent birds mass together on the sea, calling the young. The young respond with repeated peeping notes. Add to this the cries of Cassin auklet, boreal and fork-tailed petrels which often nest on the same islets, and the volume of noise is considerable.

Nesting

The ancient murrelet lays two eggs at the end of a burrow excavated in the ground in late April and May. The burrows are situated on islands and usually on coniferous forest slopes bordering the sea. Burrows vary greatly in length, some extending only a foot or two, others reaching to 4 feet (1.21 m.) and more. The burrows run from a few inches to a foot or so below the surface, but sometimes go to considerable depths under tree roots and rocks. The birds dig the burrows with their feet which, being webbed and clawed, are admirably suited for the purpose.

Eggs are very large for the size of the bird. They are ovate in shape and are about the size of a medium chicken egg. Colour is variable, running from green through buffs and browns in base colour, splotched with darker markings. Period of incubation is probably about three weeks. Main hatching takes place in late May and early June, but eggs may still be found in July.

Unlike other alcids, the young of this species are precocial and leave the nest shortly after hatching. The nesting activity is nocturnal. Adult birds incubating the eggs come and go from the nesting-site only after dark. Shortly after hatching, young leave the nest and run to the sea, where calling parents are uttering their shrill cries. How parent birds recognize their own young among

the hundreds moving out in the dark is a mystery, but they do, as chicks bypass many calling adults before teaming up.

By daylight the littoral waters adjoining the breeding colony are devoid of young birds, all having proceeded well out to sea with their parents. In August and September, when the young birds have attained larger size and juvenal plumage, the family groups return to inshore waters. Several newly hatched, downy ancient murrelets released experimentally by day in the vicinity of a nesting colony at Henslung Bay in the Charlottes were immediately preyed upon by glaucous-winged gulls nesting in the vicinity. Perhaps it is to escape such predation that the young move out to sea where these large predacious gulls are not so numerous at that time of year.

Food

Marine crustaceans, mainly euphasid shrimps, are most often found in the stomachs of these birds during the summer months. No doubt small herring and sandlance are taken as well. Like other alcids this species is swift and adept underwater and probably takes such small schooling fishes with ease.

Migration

After the breeding season, some ancient murrelets move considerable distances southward to Baja California in winter. It is a common bird around the south end of Vancouver Island during the winter months.

CASSIN AUKLET

Description

The Cassin auklet is the smallest of the alcids occurring in British Columbia coastal waters. It measures 8 inches (20.2 cm.) from bill to tail. The body is dull, even grey above, white to lighter grey below. The only distinguishing mark is a small white spot that shows over the eye. The feet are black with greyish webs. Tail feathers and wings are black. The bill is stubby and dark. In general this bird has a round, dumpy "no neck" look similar to the dovekie of the Atlantic. In British Columbia it resembles no other bird. Plumages are similar summer and winter, sexes are coloured alike, and young of the year resemble the adults.

Cassin auklet.

These birds are seen on the sea, coming ashore only to nest, and then only at night. Sometimes sick, oiled, or injured birds are seen on the beaches or perched on floating debris.

Range and Variation

The breeding range of the Cassin auklet extends from the Aleutian Islands south to lower California. We have no records of it nesting on the coastal Mainland. It seems to nest entirely upon islands where there are no predatory land mammals. In British

Columbia the Cassin auklet is known to nest on the Queen Charlotte Islands, the Moore Islands, Scott Islands, Pine and Tree Islands, and on Cleland Island. In winter the birds disperse over the seas adjacent to their breeding range.

The population is divided, with concentrations at the northern and southern extremities of the range. Slight differences, not apparent in the field, have led to the recognition of two geographic races. Only the northern race occurs in British Columbia.

Voice

On the sea this bird is mostly silent, but at night on the breeding grounds it makes a lot of noise. The call, difficult to describe, is a three-syllabled creaking call repeated usually three times, pause, then repeated over and over again when the bird is excited. Grunting, croaking, and two-syllabled notes are also heard.

Nesting

Like many other sea birds, the Cassin auklet comes to its breeding colonies only after darkness has fallen. It excavates burrows in the soil, some shallow, others extending to 6 or 8 feet (2.5 m.) or more, often along side of roots or fallen trees where such occur. The single, dull-white egg is laid at the end of the burrow in April, peak of hatching is mid-May, with young appearing on the sea in early July. Both sexes incubate, one bird returning from the sea at night to relieve its incubating mate or to feed the young. Young hatch after about three weeks to a month of underwing incubation (this species has no brood patch). Young are fed and remain in the nest until capable of flight, then they take off to the sea. There is evidence on the southern breeding grounds that more than one brood is raised annually. No such evidence has yet been found in several colonies examined in British Columbia.

Food

Euphasid shrimp seems to be the main food of the Cassin auklet on the British Columbia coast. It is likely that other small marine crustaceans and small schooling fishes are also taken if opportunity permits. Underwater locomotion is swift and accom-

plished by the wings, not the feet. Both young and old birds examined during the height of the breeding season were extremely fat, indicating an abundance of food and an ability to take it easily.

Migration

Migration with this species appears to be local. The birds are concentrated around the breeding areas during the summer months and some simply move to adjacent waters during the winter. In summer they are not seen along the east side of Vancouver Island but appear there in the winter, presumably from breeding colonies along the west coast of Vancouver Island or Washington State.

RHINOCEROS AUKLET

Description

The rhinoceros auklet also has the chunky, short-necked appearance that typifies this group of diving birds (alcids). It measures about 13 inches (33 cm.) from bill to tail. Sexes are coloured alike, but summer and winter plumage and bill differ. At rest on the water at distance the bird appears completely dark. Closer inspection reveals that it is blackish above, throat and upper breast dark grey, fading to paler grey almost white on lower breast and abdomen. In winter the head and bill have little or no adornment, both appearing simply black. The bill at this time is simple in outline, with the heavy upper mandible curving sharply to meet the lower (Fig. 6).

Fig. 6. Plumage and bill adornments, summer and winter.

In summer (breeding) plumage, adult birds develop a characteristic "horn" on the upper mandible. It is from this that the

species is named. The mandible is no longer black, but pale greenish-yellow with orange and black line markings. Both sexes also grow narrow plume-like off-white feathering running back from the base of the lower mandible and from above the eye. The rhinoceros auklet is thus easily identified when in summer plumage. It is much larger than the murrelets and Cassin auklet and is not likely to be confused with the distinctly marked puffin, murres, and guillemot.

Rhinoceros auklet.

Range and Variation

The rhinoceros auklet occurs in one form throughout its range. The breeding range in North America extends from southeastern Alaska south to Destruction Island off Cape Flattery and in Asia from the Maritime Provinces, Southern Kuriles, south to Korea and Honshu. In British Columbia, known rookeries include the following islands: Langara, Kunghit, Anthony, Lihou, Helgeson, Lucy (off Prince Rupert), Pine, Triangle, Cleland, and the Seabird Rocks (Guiguet, 1971). At one time these auklets were known to nest on Whidbey and Smith Islands in Georgia Strait and on the Farallon Islands off California. Apparently, the birds have deserted the California islands as nesting areas. The rhinoceros auklet is often seen in numbers around Victoria and Sidney on the east side of Vancouver Island during the breeding season. Most of these birds may come from Protection Island off the coast of Washington, but I suspect closer undocumented colonies are the source. In winter the birds range along the Pacific Coast south to California.

Voice

This bird is silent in flight and when at rest on the sea. At night, on the nesting-site, a variety of noises that can be described only as groans or growls are heard. Parrot-like shrieks and cries intermixed with these sounds and emitted by hundreds of individuals produces quite a volume of noise. The racket is greatest when the birds first arrive from the sea as darkness falls.

Nesting

The rhinoceros auklet comes ashore only to nest, spending the remainder of its time at sea. It comes to the breeding island only at night, flying in to crash into the brush and thence to scuttle into the burrow. Burrows are usually excavated adjacent to and facing the sea on larger islands and all over smaller ones. They extend to 20 feet (6 m.) or more in length and often have a blind end offshoot somewhere along the way. The burrow ends in an excavation which varies in size, but is usually large enough to hold two or three auklets and often high enough to allow them to stand up in penguin-like stance. In an old colony on Kunghit Island we found

burrows that had exceptionally large terminals, large enough to hold a man. The egg is laid in the terminal excavation. Nesting material may or may not be used, when present it consists of salal leaves, dried grass, and the like.

A single, large, white egg with obscure lavender markings is laid usually late April or May. Young hatch after an incubation period of about three weeks. Young are covered in dark brownish-black down which is gradually replaced by juvenal (first winter) plumage. This resembles that of the winter adult; white markings on the head are absent and there is no bill adornment. Young of the year are smaller and darker than adults and appear on the sea in mid-August. Young are fed in the nest by the adults, which probably "swing shift," one remaining at the nest during the day, the other returning from the sea at night to relieve the incubating mate or to bring food for the young.

Food

The rhinoceros auklet is often seen with the bill loaded with sandlance or small herring. It is known also to eat small crustaceans such as euphasid shrimp. No doubt a wide variety of species of small schooling fishes and crustaceans are taken as opportunity permits. Like other short-winged divers, this species propels itself beneath the water by means of the wings, not the feet. It travels at remarkable speed in this manner, capturing its prey by underwater pursuit. Small herring and sandlance often "ball up," forming spherical wriggling masses of varying size. These concentrations are fed upon by salmon, porpoises, seals, and birds. As mentioned previously, it is possible that predators, including short-winged divers, are instrumental in this "balling up" of small schooling fishes. However, I have observed such "ball ups" on several occasions when, apparently, there were no predators, either fish or birds, about.

Migration

Winters from the breeding grounds south to Baja California. Large movements up and down the outer coastlines throughout the year probably represent movements related to food supply.

TUFTED PUFFIN

Description

The tufted puffin is a large, thick-bodied diving bird measuring about 15 inches (38.1 cm.) in total length. The sexes are coloured alike. In breeding plumage the body and wings are black throughout. The head is adorned by a large white patch on either side, above which prominent pale-yellow feathering sweeps back as two curved plumes. The bill at this time is large, ridged, and flattened laterally and is bright orange in colour, greenish toward the base. The feet are bright orange and a bright-orange ring circles the pale-yellow eye. In winter the plumes and white face patches are

Tufted puffin.

greatly reduced or lacking. The bill also is reduced in size and dull red in colour, while the eye is bluish. Young of the year resemble winter adults, but have smaller ungrooved bills and greyish underparts.

Range and Variation

This species occurs in only one form throughout its range. In North America it nests on islands from the Aleutian Chain south along the coasts of Alaska and British Columbia to California. It is more abundant in the northern parts of the range. On the Asiatic side it occurs south to Korea and Japan.

Nesting colonies are numerous along the British Columbia coast. Known colonies of varying size, some very large, are known from the Queen Charlotte Islands, the Scott Islands, Moore Islands, Storm Islands, Solander Island, Clark Island, Cleland Island, the Seabird Rocks, and Mandarte Island.

In winter the birds are dispersed widely in coastal waters.

Nesting

The tufted puffin, unlike most other sea birds in this group, is active about the breeding colonies during daylight hours. Activity intensifies, however, at dawn and dusk, with a great deal of flighting, landing, and taking off. This activity indicates major periods when individuals tending the nest are relieved by their mates.

Most nesting areas rise steeply from the sea and are usually covered in coarse grasses or low shrubbery. Burrows are excavated in the soil to lengths of 20 feet (6.5 m.) or more. Others are very shallow, to only 2 or 3 feet (less than 1 m.). In some situations, the tufted puffin nests in natural recesses, crevices, and broken rock.

The single, large, bluish-white egg, sometimes faintly marked in brown, is laid usually in June. Young hatch after an incubation period probably similar to that of other puffins, 40 to 44 days. In the extreme southern part of the range, two nestings per season are said to occur, one in May and one in July (Bent, 1919). We have no evidence that more than one hatch takes place in British Columbia.

Downy young are black above, slightly greyish below. They are fed in the burrow until fully fledged, appearing on the sea in late summer and fall.

Voice

The tufted puffin utters low growling noises when disturbed in the nesting burrow. Otherwise it seems to be a silent bird.

Food

Food of this species is varied. In my experience on the British Columbia coast, small schooling fishes such as sandlance and herring make up the bulk of the diet. These are secured in winged underwater pursuit; the bird is often seen with several in bill at the same time. Bent (1919) lists mussels, sea urchins, and other sea foods, including algæ, as part of this bird's diet. Those I have examined, taken during the breeding season, contained only the small fishes mentioned.

Migration

Largely nonmigratory, except in the extreme northern part of its range where it is said to winter "somewhat north of their summer home" (Bent, 1919). In British Columbia the birds scatter over wide ranges of open sea and are often seen in waters adjacent to the coast (Weathership Reports, 1970). No doubt availability of food has a bearing on winter movements.

HORNED PUFFIN

Description

The horned puffin measures about 12 inches (30.5 cm.) in total length. It is named after two little projections that it has above the eyes. Adults are coloured alike and have the short, stout appearance common to this group of birds, but with a larger than usual head, typical of the puffins. The body colour is generally white below with a black band on the foreneck and light patches on each side of the head. The large, highly coloured, laterally compressed bill also typifies puffins in the breeding season. Young of the year and winter adults have dark bills greatly reduced in size, and the white plumage is dull. This species is easily separated from the tufted puffin by its light underparts, and, in the breeding season, lack of yellow plumes on the head.

Horned puffin.

Range and Variation

Breeds in northeastern Siberia, Kamchatka, the Kuriles, and intervening islands on the Asiatic side; and from the Alaskan coast at Cape Lisburne south through the islands of the Bering Sea to the Aleutian Islands and along the Alaska peninsula east and south to Glacier Bay and Forrester Island.

Forrester Island is plainly seen from the northwestern extremities of the Queen Charlotte Islands, and these birds have been sighted along the west coast of Graham Island (Guiguet, 1946). The late Armand Peve, who lived on Langara Island, reported dead horned puffins washed up on the beaches in numbers one winter in

the early 1940's. Specimens have also been recorded on the Washington and Oregon coasts in winter. It seems, then, that this species forages in winter off British Columbia's outer coastlines despite the fact that so far we have no specimen records for the Province.

The horned puffin appears in one form throughout its range. The common puffin, which occurs on the Atlantic, is similar in appearance to the horned puffin but is regarded as a separate species.

Nesting

The horned puffin nests in burrows tunneled in to a distance of 1 to 10 feet (3 m.). The single white egg, sometimes with lavender markings, is laid, usually in June, at the expanded end of the burrow. Both parents take part in incubation which probably, like that of the common puffin of the Atlantic, lasts from 40 to 43 days. Young are fed in the burrow until grown. They appear on the sea in August (Godfrey, 1966).

Voice

Said to make growling and grunting noises when in the nesting burrow. Otherwise mostly silent.

Food

In Alaska, food is said to comprise mainly of sandlance, smelt, stickleback, small herring, and the like.

Migration

In fall and winter the horned puffin apparently forages in offshore waters along the Pacific Coast south at least to Oregon.

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